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ELECTRICAL ACCIDENTS IN GREAT BRITAIN.

Upon other pages of this issue will be found a summary of certain parts of the annual report of the electrical inspector of factories in Great Britain. This is taken up largely with a detailed account of accidents which have occurred in central stations, isolated plants and factory installations, and a number of very interesting points are brought out. It is to be regretted that the report is too long for us to publish in full.

In Table I, which enumerates the accidents occurring in central stations, electric railways and isolated generating plants, it is to be noted that the number of accidents from electrical causes is much smaller than the number due to other causes of a mechanical nature. The total of the latter is 308, including 8 fatalities; whereas the number of electrical accidents totals 74 with only 4 fatalities. This shows that the most dangerous features of such generating stations are not due to the presence of electrical apparatus nor to the presence of a high voltage within the station. It indicates also that the user of electrical power who generates his own current is multiplying the likelihood of accidents and even fatalities among his employees. This point should have consideration in making a choice between central-station service and an isolated plant.

The accidents occurring in connection with the electrical equipment are due in most cases to faulty design and construction or to gross carelessness on the part of the men. A perusal of the instances enumerated by the inspector, Mr. G. S. Ram, shows that a great many unnecessary risks are taken by the electricians, and that the most elementary precautions are frequently neglected both by the workmen themselves and by those who are in responsible charge. In one case a change in the general design of connections at the time of enlargement of the station was the principal cause of a fatality. One suggestion of the inspector seems worthy of being followed in every station where high-tension current is handled. The suggestion is that no workman undertake to go near any of the apparatus without first consulting the diagram of connections and seeing that all accessible parts are made dead and then having his work checked by a second person. This would render it well nigh impossible that there should be any conductors remaining live within his field of activity.

The desirability of having all electrical installation work done in accordance with the regulations provided therefor is brought out very strongly. In this country regulations are formulated in the National Electrical Code, whereas in Great Britain the regulations are prescribed by the Home Office of the Government. The regulations there went into effect in 1907 and the decrease in accidents in proportion to the use of electrical power after that date is very marked. The part of the report in which this is given has not been included in our summary, but while from 1907 to 1911 the connected load was doubled, the number of accidents remained almost stationary. Previous to 1907 the number of accidents increased in about the same proportion as the connected load. While the provisions of the Code in this country may in some cases appear to entail unnecessary expense, in the long run the protection to life and property attained by strict adherence to the rules is sufficient to more than offset any inconvenience or expense which is entailed.

A NEW METHOD OF MINING AND MILLING COAL.

Upon other pages of this issue there is described a unique method of mining and milling coal which has attracted some considerable attention and some favorable notice from practical coal miners. The scheme contemplates the use of electrical energy as a contributing accessory. The coal is cut by means of a motor-driven rotary cutter and delivered to a sump in a comminuted form, a stream of water washing down the face of the cut at the time the cutting tool is working. The scheme further considers sluicing the comminuted coal through pipes to a system of distribution, and it is claimed that this will produce great economies in the utilization of this form of fuel.

Whether or not all of the objections which might be raised to the handling of coal by this process have been satisfactorily answered by the inventors of this process is too big a question to go into at this time. Anything which tends toward the conservation of this natural resource and the increasing of the efficiency in the use of fuel is worthy of serious attention. Success has been accomplished in the transmission by pipe lines of natural and artificial gas for fuel, and of crude oil. It may be that some substantial use will be made of this new system of coal mining. Our own hopes and desires with regard to the centralization of coal supply and the utilization of cheap power are concerned in the burning of the coal at the pit mouth and the transmission of electrical energy to great distances, and to a market wherever it may be located. Possibly a combination of this scheme of coal mining together with the concentrating of large power houses near the scene of mining operations will in the future solve the problem of cheap power and the upbuilding of every kind of industry.

FEES FOR ELECTRICAL INSPECTION.

An interesting point was raised in our LEGAL NOTES in last week's issue regarding the right of municipal authorities to charge a fee for the inspection of electrical construction work. The particular case considered arose in Texas, which, like many other states, has a constitutional provision exempting all persons engaged in mechanical pursuits from paying an occupation tax.

The court held that the right of the Government to regulate the installation of electrical apparatus came under its police power in connection with the protection of life and property, which is notoriously placed in hazard by lack of the proper precautions in installation. A city, consequently, has a right to require a permit from those engaging in constructive work of this kind, and it also has a right to exact the payment of a fee for inspecting the work upon completion. Such inspection may properly be regarded as a part of the expense of construction and the person for whom the work is done may be required to pay a fee which will cover the actual expense of the inspection.

A significant statement in this opinion, however, is to the effect that any ordinance which permitted the collection of fees for inspection in excess of the actual cost of performing that service would be improper and would be restrained by the courts if the matter came before them in a test case. The present fees charged by the inspection departments of many municipalities are undoubtedly greater than the actual cost of performing the inspection, especially in the case of large installations, and in view of the opinion quoted above it is doubtful if such a schedule of fees could be enforced, if the persons interested chose to carry the matter to court. The opinion of the court in this matter seems entirely logical and reasonable, since any burden which is put upon the installation of new electrical work over and above that actually necessary to cover a proper inspection thereof is without any justification on either moral or legal grounds. It is in the nature of a tax of an unwarranted nature and one which in many states would probably be construed to be a violation of the constitution.

We have, upon former occasions, advocated in these columns that the expense of such inspection should rest upon the public rather than upon the owner of the property affected. This view arises from a consideration of the fact that such inspection is carried on under the police power of the Government and like other protective functions of the police the cost of this protection should be borne by the public. In the case of electrical inspection, part of the benefit accrues to the property owner whose premises are inspected, since he is thus assured that proper work has been done for him, and it may reasonably be maintained that a part of the expense should be borne by him. From this point of view it must be admitted that part of the expense should

also be borne by the public and that a schedule of fees for inspection should be less, rather than greater, than the cost of performing the inspection.

This consideration of the legality of the fees charged for municipal electrical inspection should lead those in charge of such work to a serious study of whether the local schedule of fees should not properly be amended.

ELECTRIC TRUCKING IN THE POWER HOUSE.

The increasing flexibility of the electric vehicle is well illustrated by the recent sale of a 2,000-pound truck for power-house coal-handling service in connection with the operation of a large mill. The boiler plant of the establishment is located about 100 yards away from the main coal-storage yard of the property, and under the old plan of operation all the fuel used was handled by wheelbarrows, which were pushed by the men upon an overhead runway and then dumped upon the boiler-room floor. An enterprising electric-truck salesman learned of the service requirements and initiated an immediate investigation of total costs of handling fuel, with the result that the mill owner purchased a storage-battery truck for the work. The figures showed that by the installation of a truck which can be loaded and discharged by a single man, the wages of one coal-handler would be saved and the total yearly expense would be less than where a telpher system was in operation.

It is doubtful if a more striking example could be selected of the economical use of an electric truck upon a run of such short length. The truck will be loaded by its operator from a movable platform at the coal-storage yard, run upon the discharging trestle in the boiler room and dumped by gravity upon the floor, the design permitting loading or discharge on either side. Such an application illustrates, as does the telephone between the interior of a limousine and the chauffeur's seat, the short-distance value of electrical service. There is little doubt that the industrial electric truck will soon be used in many fields of service.

SPECIFYING THE NUMBER OF SOCKETS ON BRANCH CIRCUITS.

The wiring ordinance which has just gone into effect in Portland, Ore., the greater portion of which is given in this issue, contains a number of interesting specifications. One of these is that concerning the number of sockets which may be installed in branch lighting circuits. The custom of limiting the number to 12 became a more or less fixed practice while the 16-candle-power carbon-filament lamp was the customary unit in electric incandescent lighting. Since this condition no longer exists, there is little reason for specifying twelve as the number of sockets which may always be installed on the branch circuit. The Portland plan of taking into consideration the probable sizes of the lamps to be used, is in keeping with the present practice in incandescent lighting.

CONVENIENCE AND ECONOMY IN ELECTRIC WIRING.

That the element of convenience is, in general, very much larger where electricity is used than where some other form of energy is employed instead, is a matter too well understood, as a rule, to need comment. It is worth while, however, for people interested in the progress of the electrical industry to emphasize continually the fact that the measure of convenience, and economy, too, which may be attained in an electric lighting installation depends always in a very large degree upon how the wiring is designed and done. As obvious as this may appear, a little investigation in almost any community where electric lighting is employed is sufficient to convince one that this is a fact by no means thoroughly appreciated.

It is not unusual, for example, to find the lamps used for lighting the hallways and stairways in an apartment building installed without switches for controlling the lights other than those at the lamps themselves, and too often there is a lack of adequate outlets and proper switch control within the rooms as well. A misguided desire on the part of the owner of the property to keep the first cost of the completed building low leads to the omission of such conveniences in the wiring as can be dispensed with. It must be admitted, moreover, that this sort of thing is not always discouraged by central-station managers and electrical contractors as much as it should be. With them the feeling that the cost of wiring must be kept low in order to secure the business is still much too common in many quarters.

In some cases where there are two residences or small apartment houses separated only by a party wall, but one electric service is installed for them. This is usually located in the basement of one of the buildings, and from there 660-watt circuits are run to the different apartments or rooms in both of them. All the meters, branch-circuit fuses and switches are grouped in this basement room, to which it may be that but one tenant has a key. Thus, when a fuse is blown in a circuit supplying current to some other tenant, or he desires to cut the current off from his quarters temporarily, there is liable to be annoyance and confusion because of the lack of ready access to the fuse cabinet and switches.

It is hardly necessary to add that such construction as the foregoing never tends to increase the popularity of electric service. Lack of the proper number and arrangement of switches usually results in lamps being left burning when they are not needed, and hence the consumer, in order to keep his bills for power within the desired limits, uses other current-consuming appliances very sparingly or not at all. The difficulty in having a blown fuse replaced with reasonable promptness emphasizes very strongly the still too prevalent notion that in the modern residence outlets for lighting should be piped for gas as well as wired for electricity.

Program of Convention of Illuminating Engineering Society.

As previously announced, the sixth annual convention of the Illuminating Engineering Society will be held at the Hotel Clifton, Niagara Falls, Ont., September 16 to 19. The program includes reports from the Committees on Progress and on Nomenclature and Standards, and the following papers:

"Steel-Mill Lighting," by C. J. Mundo; "High-Pressure-Gas Lighting," by F. W. Goodenough; "The Status of High-Pressure-Gas Lighting," by George S. Barrows; "Recent Developments in Gas Lighting," by R. F. Pierce; "Indirect and Semi-Indirect Illumination," by T. W. Rolph; "Recent Developments in Series Street Lighting," by C. P. Steinmetz; "Research Methods," by E. P. Hyde; "The Problem of Heterochromatic Photometry and a Rational Standard of Light," by H. E. Ives; "Reflection from Colored Surfaces," by Claude W. Jordan; "Diffuse Reflection," by P. G. Nutting; "A Study of Natural and Artificial Light Distribution in Interiors," by M. Luckiesh; "The Physiology of Vision," by T. A. Woodruff; "The Efficiency of the Eye Under Different Systems of Illumination," by C. E. Ferree; "A Proposed Method of Determining the Diffusion of Translucent Media," by E. L. Elliott; "Illumination Charts," by F. A. Beuford; "The Determination of Illumination Efficiency," by E. L. Elliott; "An Absolute Reflectometer," by P. G. Nutting; "Color Values of Illuminated Surfaces," by Bassett Jones, Jr.

Vacuum Cleaner for Street-Railway Service.

A German exchange says that an electrically operated vacuum cleaner has been adopted for cleaning the tracks of the street railways in Strassburg. The car in which the cleaner and the motor driving it are installed resembles a box car, and is propelled by an ordinary traction motor. The dirt on the track is drawn up into the closed car by the suction apparatus. The cleaner, which is operated by one man, does the work of 17 men cleaning track in the ordinary way, according to the report.

Cumberland County Pension Arrangements.

The Cumberland County Light & Power Company, of Portland, Me., has put into effect a pension system for its employees. The pension is based upon the previous earning capacity of the employee, who may retire at the age of 65, and is compelled to retire at the age of 70. Upon the death of any employee the heirs are paid $300.

New York Edison Company Secures Large Railway Contract.

The Third Avenue Railway has entered into a contract with the New York Edison Company to supply it with all of the electrical energy necessary for the operation of its various lines in the city of New York. As part of the agreement the Kingsbridge station of the railway company will be leased to and operated by the Edison company. The actual plans are still in a formative stage, since the contract does not become operative until about October. The purpose of the contract is, of course, to secure higher operating and investment economies, which means that the two systems will be so merged and jointly operated that that which is best in the one will be utilized to contribute to the improvement of the other. Both the Waterside and the Kingsbridge station are equipped with 6,600-volt, three-phase, 25-cycle generators.

Byllesby Companies Install Pulmotors.

Eleven pulmotors have been in use in the gas plants operated by H. M. Byllesby & Company and ten more have been ordered to equip other plants. All the gas properties of this company will then be equipped. Three lives have recently been saved by the use of this apparatus: two at Louisville, Ky., and one at Pueblo, Colo. One of these was a case of electric shock, one of gas poisoning, and in the third an infant had swallowed a morphine tablet. In all three cases the attending physician had pronounced the patient beyond aid, but in each case resuscitation was accomplished by the use of this apparatus.

In every city the pulmotor has demonstrated before the physicians of the city and the attention of the public directed to the machine through newspaper articles. Employees of the company are instructed in its use and are ready to respond to calls at any hour of the day or night. The machines are placed at the disposal of the public without charge.

Milwaukee Show Association Organized.

The Electrical Show Association of Milwaukee, Wis., has organized with the following officers: William G. Bruce, president; Frank A. Cannon, first vice-president; James A. Fetterley, second vice-president; A. W. Collins, secretary; George Rau, treasurer.

The object of the association is to hold an electrical show in Milwaukee next winter.

Vermont Convention.

The eleventh annual meeting of the Vermont Electrical Association will be held at Rutland, Vt., September 12 and 13.

Electric Heating in Sweden.

According to the director of the Gottenborg municipal gas and electric power station, the experiments carried on in Gottenborg last winter prove that it is practicable to use electricity for general heating purposes, and formal notice is now being given to the effect that the City is prepared to dispose of a certain amount of electrical energy for this purpose.

Since the current for heating can be supplied only between certain hours in the night, it is necessary to have the heat stored in accumulators of some sort to prolong it into the day. For this purpose the ordinary Swedish tile stoves are used, as well as specially constructed accumulators made of pot stone or similar material.

In the 22 experiments arrangements were made for heating 86 rooms, 55 ordinary tile stoves being fitted with the necessary apparatus, averaging 1.42 kilowatts, and 19 smaller stoves with an average of 1.72 kilowatts each. In the experiments 87,473 kilowatt-hours were consumed. The results were found to be rather different in different apartments, much depending on the arrangement of the different heating devices. In seven of the experiments the cost of the energy consumed was calculated at $0.007 per kilowatt-hour.

Drumm Hydroelectric Station.

The new hydroelectric station which the Pacific Gas & Electric Company will erect on Bear River, Cal., will cost about $5,000,000. It has been named after the president of the corporation.

The generating station will have an aggregate capacity of 53,000 horsepower and 200 miles of high-tension transmission line will be constructed. The station and line are expected to be completed within two years.

Grand Rapids to Abolish Lighting Towers.

The collapsing of the Logan Street electric lighting tower during a heavy wind storm that passed over Grand Rapids (Mich.) recently has made probable that the resolution introduced by Alderman Connelly providing for the passing of the historic lights will be approved by the Committee on Lights. This is the third tower to fall.

Mammoth Searchlight for Ocean Liner.

The Hamburg-American Line has installed on the *Kaiserin Auguste Victoria* an electric searchlight of 80,000 candlepower, equal in size and range to the searchlights mounted on German men-of-war. It will be used as a means of guarding against collision with icebergs and other vessels.

Acuity Tests With Direct and Indirect Lighting.

Tests carried on by Sydney W. Ashe and published in the *General Electric Review* indicate that where the intensity on the working plane is the same for either direct or indirect lighting, there is no difference in acuity either for initial values or at the end of a period of four hours. In other words, no fatigue was found to exist with direct lighting which is not also occasioned by indirect lighting. These tests were carried out in a room with white walls and ceiling, and it was necessary to use about twice as much power with the indirect lighting unit as with the direct lighting unit in order to get the same intensities of illumination. It is expected to continue the work with the same apparatus to obtain acuity values for various color tests.

Maine Association Meeting.

The Maine Electrical Association held its fourth annual convention in Portland, Me., on July 25 and 26. The following officers were elected: President, H. B. Ivers; vice-presidents, John H. Maxwell, Harry E. Plummer; secretary and treasurer, Walter S. Wyman, of Augusta; executive committee, F. D. Gordon, M. H. Blackwell, J. H. Maxwell, C. E. Smith, J. A. Fleet, H. E. Plummer, F. O. Eaton and W. S. Wyman.

An amendment to the constitution was adopted, making telephone and railway men eligible for membership. Heretofore membership has been restricted to those connected with central stations in one capacity or another.

Direct Wireless from Germany.

The new wireless station at Nauen, near Berlin, Germany, which is to replace the tower blown down in a terrific storm last March, is approaching completion.

The tower is nearly 900 feet in height, and its radius of action will, it is expected, include New York City.

California Inspectors Organize.

The California Association of Electrical Inspectors has been organized, with the following officers: W. A. Spencer, of San Jose, president; Edward W. Jewell, of San Diego, secretary; P. A. Anderson, of Oakland, treasurer.

W. W. Low.

Few men in the electrical industry, or in any other industry for that matter, have been so well and so favorably known for a decade than the subject of this sketch, Willard Wainright Low. Mr. Low, as long as we can remember, has been a popular and conspicuous figure in the electrical supply field, bringing to the conduct of his business and the upbuilding of a great reputation a hardy aggressiveness and a business instinct that it is the good fortune of a man only once in a while to possess.

W. W. Low was born at Flint, Mich., October 24, 1858, the son of Spencer F. and Julia (Seamen) Low. He was educated in the public schools of Flint and his early business efforts were directed along mechanical and manufacturing lines. Going to Detroit he became connected with the Detroit Electrical Works in 1884, which was his first connection with the electrical industry. He went to Chicago in 1887, where he became connected with the electrical supply business, and in 1891 he and Thomas I. Stacey organized the Electric Appliance Company for the handling of electrical supplies of every description. He has been president of this company since its organization.

W. W. Low,
President of the Electric Appliance Company.

Twenty years ago the electrical supply business was on a far different basis from what it is today. Under Mr. Low's direction, in company with the excellent organization of which he is the head, there has been built up a most remarkable institution. Through strict adherence to business methods and with a keen consciousness of what is required of business men that they succeed and still retain the respect and friendship of their competitors and customers, the house has thrived and grown exceedingly. Branches are now established in San Francisco, New Orleans and Dallas.

Mr. Low is a hard worker; he is an early riser and puts in long hours at his business. To his business associates and friends he represents all that is desirable in the modern successful American business man.

Lighting of Majestic Theater.

Electric lighting in moving-picture theaters is an important feature in their equipment. The moving picture, because of its tremendous advance in popularity with Americans during the past few years, has attained a status where it may demand considerable thought and attention, and the lighting facilities must meet the requirement of the theater and its patrons alike. There are various interesting features involved in the lighting of show-houses, as well as in furnishing the sharp, bright light of the machine itself, which serves to project the images on the screen.

In the tens of thousands of moving-picture theaters throughout the country, there are two classes, those which are provided with mirror screens and those which use the standard canvas or white-plaster background. The mirror screen is a comparative innovation in the photoplay industry. It is an expensive proposition, involving the installation of a big silvered plate glass behind the canvas so that the pictures are shown brightly and clearly in what amounts to daylight. Consequently the theater which is equipped with a mirror screen may be illuminated during performances even more brightly than the regular show-house. Softened light is a necessity, but darkness during the shows is not required.

Although the mirror screen has

made notable advances in the ranks of these theaters from the Atlantic to the Pacific Coast, there are still thousands of shows which cling to the canvas, which portrays pictures clearly only when the auditorium is in darkness. It is in this connection that the electrician may get in excellent work in proving to the house owner the availability of modern lighting even in an establishment which is considerably more than half the time in darkness.

In every moving-picture theater beautiful lighting arrangements are at a premium. The modern show-house depends upon an attractive appearance almost primarily in securing business, especially those theaters in the downtown districts, which depend upon transient patronage. Regarding the exterior as well as the interior, the house must possess individuality in lighting and must, in addition to pleasing its patrons with harmonious effects, secure just enough illumination to insure clear vision, for a glare of light after the darkness of a show is hard on the eyes. The proposition affecting light for the machine itself is largely one of dependability, for the exhibitor must feel assured that his facilities will not go back on him, no matter how rigorous the service to which they are put.

The Majestic Theater, of Louisville, Ky., recently remodeled throughout and enlarged into the biggest moving-picture house south of the Ohio River, furnishes an excellent example of modern electric lighting applied to a popular-priced amusement resort. The Majestic is owned by the Majestic Theater Company, of which George G. Fetter, president of the George G. Fetter Lighting & Heating Company, is president. Louis J. Dittmar is general manager of the company's properties. The Majestic was equipped for lighting and is now being served by the Louisville Lighting Company.

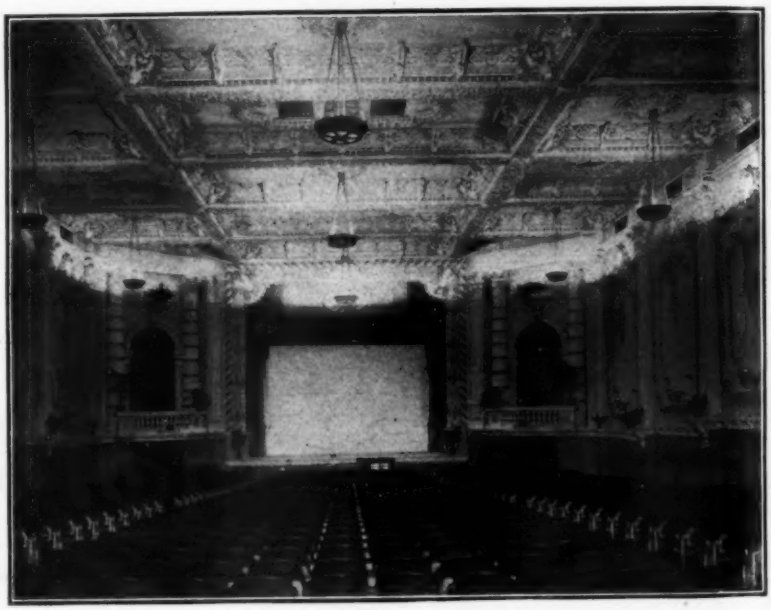
The auditorium of the Majestic is dark during the daily shows, except for illumination which proceeds from a series of wall-bracket lamps around the interior. Between shows the theater is lighted through a beautiful series of indirect reflectors. which bathe the entire theater in a flood of rose-gold light. Tungsten lamps send their light to the ceiling and it is reflected from the old-rose-colored ceiling and walls. Better or more restful lighting for a moving picture theater could hardly be devised.

The interior equipment consists chiefly of twelve swinging baskets, which provide the indirect illumination. The baskets are suspended at regular intervals from the ceiling with chains. They are handsomely constructed of bronze and opaque glass, each containing eight 60-watt lamps. The row of footlights, consisting of 125 32-candlepower carbon lamps, is rarely switched on, except in the event of a singer or a theatrical turn appearing on the stage before the screen.

The wall brackets, twenty in number, are in the shape of antique candlesticks, each containing an eight-candlepower bulb, shaded with red crepe paper, and are lighted throughout the business hours of the house. The wall equipment affords just enough light for the ushers, whose eyes are accustomed to the dim light, to guide patrons to seats during the shows, while the indirect system, when switched on during the intermission, is used to display the beauty of the South's largest motion-picture interior, which provides a total seating capacity of 1,500 persons.

The Majestic possesses two motion-picture machines of the most approved type. One set of equipment is operated regularly and the other stands ready in an emergency. Both are connected for immediate service with 30-ampere, 110-volt direct current. The current is supplied from a 500-volt, 10-kilowatt motor-generator set. For cases of emergency, two 110-volt rectifiers are provided. The generator supplies current for several 36-inch ventilating fans, as well as for the picture machines and their carbon lamps. This complement of electrical machinery is conceded to be as comprehensive and as available for any sudden or constant call as that of any moving-picture house in the country.

In its exterior the Majestic presents an appearance compatible in every respect with the qualities of the auditorium and show equipment. The entrance vestibule has a loftier arch than that usually provided in a photoplay theater. The box-office divides entrance and egress passageways, and the arch is outlined in twin series of electric lamps, the two arches being placed respectively at the upper and lower edges of the stucco ceiling. Each arch contains 50 32-candlepower lamps, and upright incandescents inclosed in opalescent glass shades ornament the box-office; entrance and exit. Two Excello flaming arcs flank the vestibule, and a big sign 50 feet above the sidewalk, containing 160 32-candlepower lamps, proclaims "Majestic" to the public for squares north and south along Fourth ave-



Majestic Theater, Louisville, Ky.

nue in the heart of the retail business section of Louisville.

Wireless Station in New Orleans.

The largest wireless station in America will be located at New Orleans, and when completed will place that city in direct communication with South America. The new station will be built by the United Fruit Company on Orleans street, near City Park, on the site of the track of the Orleans Driving Club. The grounds cover 20 acres and will be converted into a private park. The present station on Spain Street will be abandoned. The station will have Marconi equipment and will, under perfect conditions, be able to speak directly to South American ports, and to Swan Island, the relay point, at all times.

The Application of Electrical Energy in Clothing Factories.

Its Utilization for Power and Light to the Best Advantage.

By H. O. Stewart.

The two most important requirements of power transmission in clothing factories are reliability and cleanliness.

The manufacturer of clothing demands a large amount of floor space and small amounts of power scattered more or less uniformly. The exacting nature of the work requires the best possible lighting. Maximum economical speed of machines is imperative, as the output is proportional to the speed; and the payroll is one of the largest items in the cost of clothing manufacture. The chance of accident should be reduced to a minimum. Electric motor drive meets all of these requirements and its popularity is demonstrated by the rapidly increasing number of electric-motor installations in clothing factories.

Illumination of Cutting Room.

Mechanical Versus Motor Drive.

Sometime ago the writer installed a system of motor drive in two large factories which had been operating for a number of years on mechanical drive. An inspection of the factories and mechanical transmissions revealed great opportunities for motor drive. There were several mule drives, a number of long and heavy vertical belts, and a great amount of shafting and medium-weight belting, all of which absorbed considerable power. A number of machines were not up to speed on account of belt slippage.

Although the belting and shafting were in good shape, there was so much of it that the weakest links in the transmission broke down rather frequently. Sometimes a pulley would commence slipping on the shafting; at other times a belt would break or a bearing heat badly; which usually required the shutting down of the engine while repairs were made. With most of the manufacturing processes dependent on power, such a shutdown meant a closing of a greater part of the shops.

Considerable dirt and grease were thrown about the factory by the belts and pulleys and deposited on the walls and ceilings. Cloth and finished garments were frequently spotted by grease and sometimes ruined. The amount of goods damaged in this way was by no means a negligible item, chargeable to mechanical drive. This loss was kept at a minimum by the liberal use of drip pans under the hangers and by boxing-in the most troublesome pulleys and belts.

The horsepower developed by the engine was carefully determined by indicating the engine. It was found that the load was very steady and was about the same each day. A motor layout and an estimate of the electric power required was prepared, submitted to the owners, and accepted by them, and motors were accordingly installed.

Readings of the service meters, extending over several months, showed that the power taken by the electric motors was one-third that of the indicated horsepower of the engine when operating by mechanical drive.

This condition is not unique in these two factories. Clothing manufacture inherently requires small amounts of power spread over a very large floor area. On account of the better light, those processes requiring power are usually located on the upper floors. For these two reasons, if mechanical drive is used, it must of necessity be complicated and uneconomical.

Advantages of Motor Drive.

In addition to the elimination of loss of goods damaged by oil and dirt from the mechanical transmission system, the light is greatly improved by the absence of shafting and belting and the dust stirred up by the rapidly moving belts and pulleys. Motor drive does away with belts passing from floor to floor and thus saves valuable floor space and absolutely eliminates holes in the floor, thereby reducing fire risk. Other advantages we have previously mentioned.

Private Plant Versus Central-Station Power.

The amount of power used in a clothing factory is not large. A modern factory with 700 employees and with every possible mechanical device for efficiency is not likely to have an average power load greater than 20 kilowatts. An investigation of several clothing factories indicates that the lighting peak is from two to three times the average power load.

A private plant should consist of two generating units. The power generator should be capable of carrying the regular factory load and in order that the starting load of the elevators will not materially affect the voltage regulation, the generating unit should be twice the capacity of the average factory load. This means that the unit will be operated at half load with the resultant poor economy.

The lighting unit should be carefully chosen, especially with reference to voltage regulation. No generating unit should be accepted which shows the strokes of the engine in the flicker of the lamps.

During the heating season, the exhaust steam from the power unit should be used for heating. The exhaust steam from the lighting unit is not of so much value, as its load comes chiefly during the last hour or two of the day when the factory is already well heated.

Most factories require illumination for overtime work during different parts of the year. Illumination is also needed at night for cleaning up and repairing. These loads are very small in comparison to the day load and make night operation of one of the generating units very uneconomical.

Industrial Steam.

In addition to the low-pressure steam required for heating during the cold months, a small amount of live steam at approximately 60 pounds pressure is required throughout the year. Steam tables require 0.57 pound of steam per square foot of radiating surface per hour. A steam table 25 feet by 5.5 feet requires 70 pounds of steam per hour. Steam spongers draw on the steam supply very intermittently. Each roll of goods requires steaming from 2 to 4 minutes according to the weight of the goods.

Where private-plant power is used, these industrial appliances are supplied with steam from power boilers. With central-station power, either a small hard-coal boiler, or a gas-heated boiler should be used to supply steam to the steam tables and spongers. A comparison of the relative costs of operating by each method will decide which should be adopted. A small hard-coal boiler needs very little attention, the labor item being very small. A gas-heated boiler should be located in the sponging room and should have both automatic boiler feed and automatic pressure regulation. If steam spongers only are used, it is much more economical to equip and operate them with small individual gas boilers installed on the sponger.

Comparative Costs of Power.

To determine from a financial standpoint whether private-plant or central-station power should be adopted, a balance sheet may be drawn up showing the amounts of the various items.

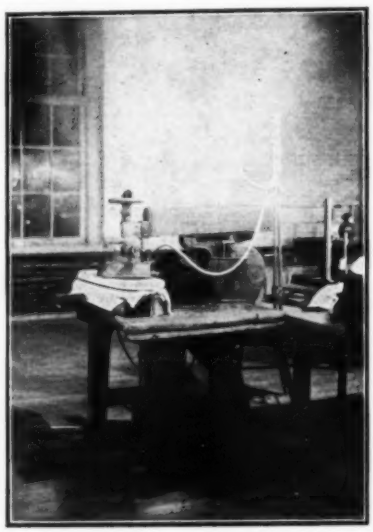
The writer has in mind a modern private power plant which was recently discarded in favor of central-station power principally on account of the undue amount of time which the manager was compelled to spend superintending its operation.

Just as a fair profit is expected on any investment, a fair profit should be charged against the private plant. The percentage of profit should equal the profit earned on the most profitable part of the manufacturer's business that is capable of extension. In case no part of the business is capable of extension, the rate of profit should equal that which the money will earn if invested outside of the business.

In addition to comparative costs, reliability of service is especially important, as the output is so largely dependent on the power. Most modern central stations are so well equipped with reserve generating equipment that shutdowns are of very infrequent occurrence.

Factory Layout.

Maximum output at minimum cost is the goal toward which the manufacturer is ever working. The best possible routing of material and of the partly finished garment, combined with making the best possible use of the available daylight, are very important factors in increasing efficiency. If the building is long and narrow, the sewing-machine tables should be located parallel and as near to the building walls as possible. The sewing tables, where work of an exacting nature is done, should also be similarly located. The less exacting work should be located in the middle of the building. If the building is broad and well lighted by daylight, it is often advantageous to place the sewing-machine tables, as well as those tables on which the best light is required, at right angles or at the most desirable angle to the building walls. This angle will depend somewhat on the size and spacing of the windows and should be determined by experiment. The length of these tables will usually be limited by the amount of daylight obtainable on the inside ends of the tables. White oil-painted walls and ceilings increase the amount of effective light. Those processes which do not require so much light should be carried on in the center of the floor.



Illumination on Presser.

The tables in the cutting rooms are generally placed at right angles to the building walls. As the cutters stand at their work and work from both sides of the table, it would be poor practice to place these tables parallel to the windows where those working with their backs to the windows would be standing in their own light.

Selection of Motors.

Nearly every type of machine found in a clothing factory runs at constand speed. For this reason either alternating or direct-current motors can be used to advantage, although it is evident that as most of the motors in the clothing factory are not larger than five-horsepower, the extreme simplicity of control of the induction motor is a strong point in its favor. Induction motors of less than 7.5 horsepower are started by simply closing a switch.

Motor Layout.

Sewing Machines.—In general, where there are a number of sewing machines on somewhat similar work, group drive is preferable. Tests show that a group drive of ten sewing machines in the average clothing factory takes one horsepower. If individually driven, each machine should be equipped with a one-sixth-horsepower motor. While the load-factor on a single sewing machine is low, the load-factor on a group-drive motor is high. This is due both to the approximately regular periods at which each machine is working and to the fly-wheel effect of the rotating parts. Group drives of from ten to thirty machines are most desirable, twenty being the average. Slow-speed motors, either alternating-current or direct-current, should be used and should be direct-connected to the shafting driving the machines. These motors should run at approximately 500 revolutions per minute. This arrangement is by far the simplest and most satisfactory.

When changing over a factory from line-shaft drive to motor drive, in case conditions demand it, motors of higher speeds can be placed under the tables and connected with short belts to the sewing-machine table shafting. Motors and belts should be properly boxed in as a guard against accident.

Power Pressers.—Medium-size compressed-air pressing machines require 0.5 horsepower per presser. An air compressor capable of delivering air at 75 pounds pressure should be belted

(Continued on page 251)

Clothing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Small clothing manufacturer, located in Wisconsin.

Total connected horsepower, 19.25. Number of motors installed, 6. Average kilowatt-hours per month, 880.

Kilowatt-hour consumption for 12 months:

Month.	Kilowatt-hours.	Month.	Kilowatt-hours.	Month.	Kilowatt-hours.
January	910	May	894	September	766
February	902	June	950	October	852
March	871	July	762	November	1,022
April	877	August	989	December	774

Load-factor, 8.5 per cent.

MOTOR INSTALLATION.

Following is a list of the motors with their respective drives. Supply source is 220 volts, direct current.

No.	Horse-power.	Speed R. P. M.	Application.
1	7.5	825	Belted direct to freight-elevator mechanism.
1	4	1,175	Belted direct to high-pressure fire pump.
1	1	1,200	Belted to small air compressor.
1	2.5	450	Belted to line shaft driving 17 factory sewing machines.
1	1.25	480	Belted to line shaft driving eight factory sewing machines.
1	3	...	Belted to line shaft driving a battery of 20 factory sewing machines.

Clothing plant manufacturing overalls, shirts, pants and duck clothing, having an average output of 4,100 dozen garments per month. A laundry is operated in conjunction with the clothing factory, which is supplied with high-pressure steam by a small vertical high-pressure boiler, consuming about 500 pounds of coal per week.

Total connected horsepower, 69.6. Number of motors installed, 21. Average kilowatt-hours per month, 1,912.

Kilowatt-hour consumption for 11 months: January, 3,530; February, 3,400; March, 3,620; April, 3,360; May, 1,200; June, 880; July 940; August, 190; October, 2,460; November, 730; December, 2,640.

The approximate electrical energy consumption per dozen garments manufactured is 0.46 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. Load-factor, 5 per cent.

No.	Horse-power.	Speed R. P. M.	Application.
1	15	750	Direct-connected to elevator engine. This motor is a 500-volt compound-wound machine.
3	0.2	2,550	Each direct-connected to an Eastman garment-cutting machine.
1	2	490	Belted to shaft driving bench grinder and small engine lathe.
15	3.25	475	Direct-connected to shaft driving factory sewing machines. Each motor drives from 15 to 24 sewing machines; one motor having in addition to the sewing machines a National Laundry Machinery Company collar starcher; another motor drives, in addition to its quota of sewing machines, an American Laundry Machinery Company bosom ironer.
1	3.25	475	Direct-connected to shaft driving four button machines. Pulley on commutator end is belted to a one-kilowatt 110-volt generator for operating the Eastman cutting machines.

In addition to the motors there are installed six 8-pound electric irons and two 15-pound irons.

Clothing factory manufacturing men's shirts and also the pasteboard shipping boxes. There are 900 employees working 60 hours per week. The average output is 2,000 dozen finished shirts per week.

Total connected horsepower, 27. Number of motors installed, 10. Average kilowatt-hours per month, 1,687.

Kilowatt-hour consumption for 12 months: January, 1,573; February, 1,704; March, 1,796; April, 1,652; May, 1,831; June, 1,726; July, 1,334; August, 1,729; September, 1,679; October, 1,690; November, 1,813; December, 1,727.

Load-factor, 11.4 per cent; operating-time load-factor, 30.5 per cent.

The electrical energy consumption per 1,000 completed shirts is 16.3 kilowatt-hours.

MOTOR INSTALLATION.

The supply source is three-phase, 60 cycles, 220 volts. The motors are all of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	4	1,120	Belted to a 40-foot shaft driving one J. T. Robinson scoring machine; one Holb automatic box ending machine; one Horace Inman corner cutter; one American Box Company slitter; one agitator for glue cooker; and one Knowlton & Beach corner stayer.
1	2	1,100	Belted to a 14-inch cut-off saw.
1	0.5	1,120	Belted to 9 feet of shafting and one countershaft driving one 10-inch emery wheel; and one sewing-machine test table.
1	1	1,120	Belted to a B. F. Sturtevant 20-inch blower.
1	5	1,120	Connected by Morse 1.5-inch chain to a 2,000-pound freight elevator.
1	1	1,120	Belted to 30-inch exhaust fan.
1	1.5	1,120	Belted to a 30-foot shaft (six hangers) driving one Adams Laundry Company ironer; one Troy Laundry Company dampener; and one agitator of "Textile" starch mixer.
1	4	1,120	Connected by Morse 1.5-inch chain to 70 feet of shafting (17 hangers) driving 12 Singer 63-1 sewing machines; seven Wilcox & Gibbs sewing machines; four Singer 71-22 sewing machines; five Singer 44-20 sewing machines; and four National buttonhole machines.
1	4	1,120	Connected by 1.5-inch Morse chain to 70 feet of shafting driving 34 Singer 44-20 labeling machines.
1	4	1,120	Connected by 1.5-inch Morse chain to 50 feet of shafting driving six Union special yoke machines; and 12 Singer 44-20 sewing machines.

Clothing Data—Sheet No. 2.

Clothing manufacturing plant, name withheld, located in Middletown, N. Y., having an average output 600 dozen shirts per week and an additional production equivalent to 150 dozen shirts per week, consisting of shirt specialties such as collars, neck bands, etc. Group drive. Running hours per week, 54.

Total connected horsepower, 13. Total number of motors installed, 2. Average kilowatt-hours per month, 1,524.

Kilowatt-hour consumption for 12 months:

Month.	Kilowatt-hours.	Month.	Kilowatt-hours.	Month.	Kilowatt-hours.
June	1,364	October	1,431	February	1,514
July	962	November	1,236	March	1,677
August	1,222	December	1,475	April	1,771
September	1,295	January	1,548	May	1,795

Load-factor, 21.5 per cent; operating-time load-factor, 65.6 per cent.

The approximate total electrical energy consumption per dozen shirts manufactured is 640 watt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. Motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,140	Belted to a line shaft driving 140 Singer factory-type sewing machines.
1	3	1,720	Belted to a 1,000-pound elevator.

Energy is supplied by the Orange County Lighting Company.

Clothing plant manufacturing a complete line of overalls and work shirts. The average output is about 200 dozen garments per day. 300 men are employed working 48 hours per week. Combination drive.

Total connected horsepower, 74.5. Total number of motors installed, 13. Average kilowatt-hours per month, 5,369.

Kilowatt-hour consumption for 12 months:

Month.	Kilowatt-hours.	Month.	Kilowatt-hours.	Month.	Kilowatt-hours.
June	6,168	October	5,483	February	5,599
July	4,464	November	6,022	March	5,533
August	4,111	December	6,825	April	4,440
September	5,168	January	4,682	May	3,941

Load-factor, 13.2 per cent; operating-time load-factor, 42.5 per cent.

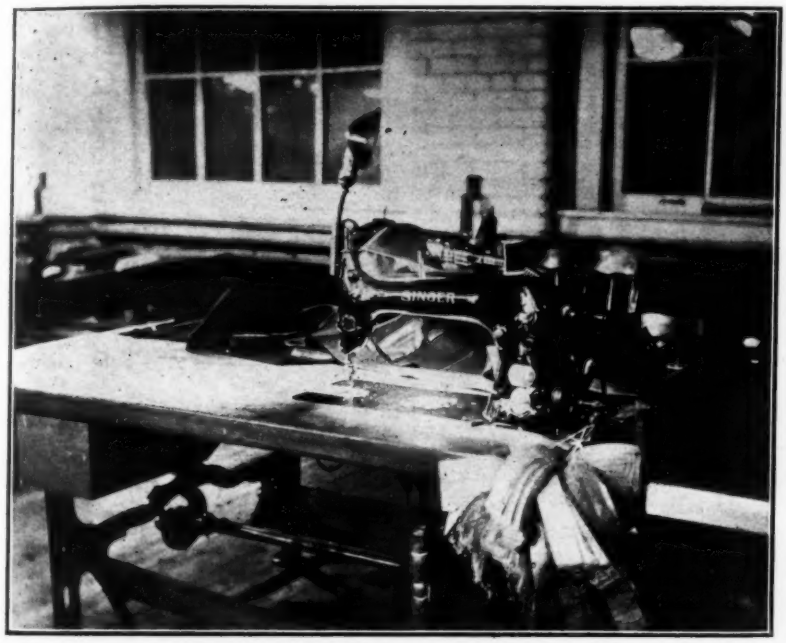
MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 220 volts. All motors, except the one indicated, are of the squirrel-cage induction type.

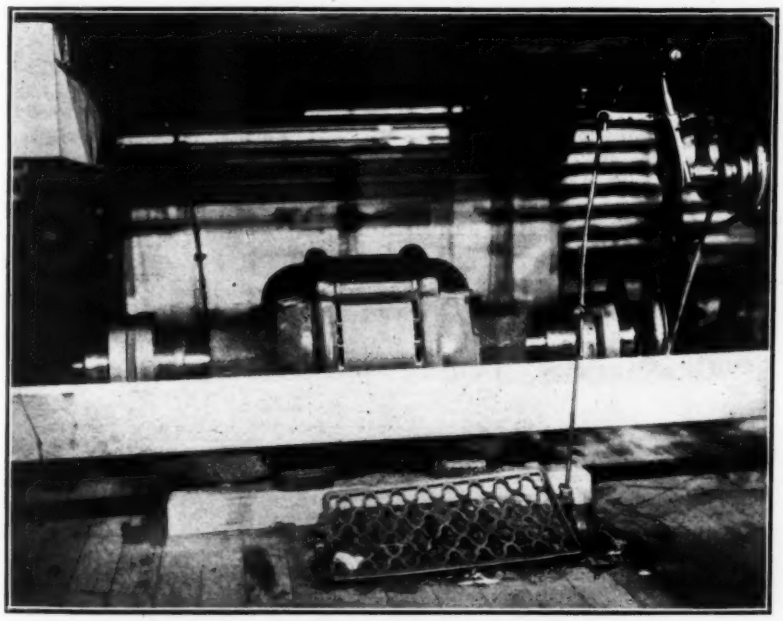
No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,700	Belted to a 50-foot shaft (13 hangers) driving nine Singer 57-2 sewing machines; 13 Singer 31-20 sewing machines; and three 16-inch disk ventilating fans, 1,700 revolutions per minute.
1	5	1,700	Belted to 50-foot shaft (13 hangers) driving seven Wheeler & Wilson 24-W-4 sewing machines; 18 Singer 31-20 sewing machines; and three 16-inch disk ventilating fans, 1,700 revolutions per minute.
1	5	1,700	Belted to 50-foot shaft (13 hangers) driving two Singer 71-34 sewing machines; 15 Singer 31-20 sewing machines; four button-fastening machines made by the Universal Button Fastening Company; two Scovill Manufacturing Company button-fastening machines; three Reece button-hole machines; one 1.5-kilowatt, 110-volt, 1,750-revolutions-per-minute direct-current generator supplying current for five Eastman Machine Company cloth-cutting machines; and three 16-inch disk ventilating fans, 1,700 revolutions per minute.
1	5	1,700	Belted to 50-foot shaft (13 hangers) driving 26 Singer, size 31-20, sewing machines; and three 16-inch disk ventilating fans, 1,700 revolutions per minute.
1	5	1,700	Belted to 50-foot shaft (13 hangers) driving 24 Singer, size 31-20, sewing machines; and three 16-inch disk ventilating fans, 1,700 revolutions per minute.
1	5	1,700	Belted to a 50-foot shaft (13 hangers) driving three Union special sewing machines; five Singer, size 31-20, sewing machines; eight Singer, size 31-15, sewing machines; and three 16-inch disk ventilating fans.
1	5	1,700	Belted to 50-foot shaft (13 hangers) driving 22 Singer, size 31-15, sewing machines; and three 16-inch disk ventilating fans, 1,700 revolutions per minute.
1	5	1,700	Belted to 50-foot shaft (13 hangers) driving 12 Singer, size 31-15, sewing machines; 12 Singer, size 31-20, sewing machines; and three 16-inch disk ventilating fans, 1,700 revolutions per minute.
1	5	1,700	Belted to a 50-foot shaft (13 hangers) driving two Union special sewing machines; 20 Singer, size 31-20, sewing machines; and three 16-inch disk ventilating fans, 1,700 revolutions per minute.
1	5	1,700	Belted to a 50-foot shaft (13 hangers) driving two Wilcox & Gibbs sewing machines; 12 Singer, size 31-15, sewing machines; one Singer, size 71-30, sewing machine; seven Union special sewing machines, class 7,400, double lock stitch; and three 16-inch disk ventilating fans, 1,700 revolutions per minute.
1	1	1,700	Belted to a 12-foot shaft (three hangers) driving one small nine-inch bench lathe; and one 26-inch by 3-inch grindstone.
1	0.5	1,700	Coupled to a Paul deep-well pump.
1	18	870	Slip-ring motor coupled to a Parkhurst Manufacturing Company 3,000-pound freight elevator, 40 feet per minute.

or geared to a motor equipped with a fly-wheel. Heavy pressers obtaining their pressure at the iron through levers take 1.5 horsepower per machine. The machine should be belted to a motor having a heavy fly-wheel.

In those departments where there are a large number of employees in a rather restricted space, forced ventilation is most desirable. It is not uncommon to find in some departments one employee per 40 square feet of floor space. Each person should have 1,500 cubic feet of fresh air per hour in order to work at his highest efficiency. A system of ventilation should be so laid out that tempered air is forced into the rooms at various points and the foul air drawn out. In some localities, it may be desirable to use this system of ventilation during the warm weather as well. In the sponging department the steam which escapes into the room, is drawn out by means of exhaust fans placed in the upper part of the walls. The usual type of fan for this purpose is 30 inches in diameter, runs at 700 revolutions per minute and takes one horsepower.



Illumination on Sewing Machine.



Direct-Connected Sewing-Machine Motor.

Blowers and Fans.—Gas irons are quite generally used for pressing, the most successful iron operating on an air blast. Each 18-pound iron takes 8 cubic feet of gas and 64 cubic feet of air per hour. Rotary blowers operating at one pound pressure require approximately one horsepower per 30 cubic feet of air per minute.

Spongers, Winders, and Wringers.—Power-driven sponging machines of average size take 0.5 horsepower. Cloth-winding or folding machines take 0.5 horsepower. Power-driven wringers take 0.5 horsepower.

Cutting Machines.—Direct-connected portable cutting machines are used for cutting a large number of thicknesses of cloth at one time. Some of them will cut a layer of cloth three inches thick. Their horsepower varies from one-thirtieth to one-sixth.

Electric Irons.—Electric irons of from 15 to 18 pounds in weight have been successfully used. It has been found that less goods are scorched and that there is no shine left on the goods when electric irons are used.

Miscellaneous Power Requirements.—Up-to-date clothing factories are equipped with elevators, vacuum cleaners, ice machines for cooling drinking water and small motor-generator sets for charging the battery for the telephone and call sytems. If the factory maintains a lunch room, the kitchen is equipped with electric meat cutters, potato parers, ventilating fans, and electric irons.

Clothing-Factory Illumination.

On account of the unusually severe requirements of a system of illumination in clothing factories, particular attention should be given to a careful study of the conditions to be met. Before attempting a lighting layout, there should be determined:

(1) Where the light is needed.

(2) Where the maximum amount of light is required.

(3) The direction from which the light should come.

(4) The intensity of light for different classes of work.

(5) Best color of light.

First-class illumination increases the output and improves its quality. This is especially true in the clothing industry where all of the work is partially done by hand. Inadequate illumination means eye strain, and discontent among employees and results in reduced efficiency and an increase of "seconds."

Amount of Electrical Energy Used.—An investigation of several clothing factories shows that during the four winter months the kilowatt demand for lighting is about double the power demand and that this peak has a three-hour daily duration in a ten-hour-a-day factory. This peak tapers

off on either side of these four months (November, December, January and February) and is a minimum in June. In fact, there is no peak to speak of from May 1 to September 1, except that occasioned by very dark or stormy weather.

These conditions obtain in the average modern clothing factory. Factories having an insufficient amount of daylight at the machines and sewing and cutting tables will have a peak of longer daily duration which will be of about the same magnitude throughout the year but of shorter duration during the brightest months. It is also the case that in the factory with meager daylight illumination, many of the employees find it absolutely necessary to use artificial illumination continuously.

Daylight Illumination.

The arrangement of the machines and tables should be such as to take advantage of the daylight to the greatest extent consistent with the best routing of materials and partly finished garments. Light-colored floors and ceilings painted with white oil paint increase both the natural and artificial illumination to a surprising extent.

On account of its color value, high efficiency, and its adaptability to various conditions, the tungsten lamp has come into very general use in clothing factories. With the exception of the individual lights on the sewing machines and a few of the sewing tables, the tungsten lamp has been very generally substituted for the carbon. Where individual lighting is necessary, general illumination of low intensity, with the units close to the ceiling, is very desirable. In the following paragraphs, there will be described lighting layouts for the different kinds of work as carried on in the various departments. These installations are in actual use and are entirely satisfactory.

Sewing-machine illumination requires an intensity of approximately ten foot-candles at the needle. On account of its high intensity and the angle at which the light should strike the needle, individual lighting is generally adopted. Four or eight-candlepower lamps, equipped with concentrating metallic reflectors, and either mounted rigidly on the machine frame or on a flexible arm fastened to the table, give best results. Reflectors should be so selected and placed that no light is thrown about the room. The following comparison shows strikingly, the value of proper reflectors. A bare eight-candlepower lamp suspended from a drop cord 14 inches above the table gives a 2.5-foot-candle intensity of light at the needle. The same lamp equipped with the proper reflector illuminates the needle with an intensity of ten foot-candles. The bare lamp irritates the operator's eyes as well as those of others about him and furnishes an insufficient amount of light on the work.

Sewing tables 12 feet in length are properly illuminated by two 60-watt tungsten lamps placed 4 feet above the table and equipped with intensive reflectors. This type of illumination is more economical and gives better satisfaction than individual lighting. Eight eight-candlepower carbon lamps would take more than double the power taken by two 60-watt tungsten lamps and the total maintenance cost of lamps and wiring would be much higher.

Power and hand-operated pressing machines require especially good illumination to avoid scorching the garments. 100-watt tungsten lamps placed 2.5 feet diagonally to the right and back of the iron and 7 feet above the floor have been entirely satisfactory. Intensive reflectors give the correct light distribution.

In those cutting rooms where there are a number of cutting tables placed parallel to each other and moderately close together, a single row of 60-watt tungsten lamps 10 feet apart over each table will furnish ample illumination. The lamps should be 4 feet above the tables and equipped with extensive reflectors. With this layout, the illumination from a row of lamps over a particular table supplies a considerable amount of illumination to the tables on both sides of it, thereby diminishing the intensity of the shadows caused by the cutter bending over his work. Should it be desired to use only one table, it will be necessary to use the row of lamps on each side of it as well as that over the table. If the tables are not located as indicated above, or where but one table will be used at a time, two rows of 60-watt tungsten lamps should be placed over each table, each row being over the edge of the table. The lamps should be 8 feet apart, 4 feet above the table and equipped with extensive reflectors. This layout will insure ample illumination without shadows.

Commercial Practice
Management, Rates, New Business

Reaching the Foreign Resident.

The problem of reaching the foreign element of any city in which there are enough foreigners from any country to colonize, is quite an important one to central stations in cities of the first and second class, and interesting to central-station companies of any size. Where foreign-born residents do form such colonies the older members speak their own language largely and through preference and read their own papers. These papers are generally published in the midst of the foreign-speaking district and circulate largely through the neighborhood excluding to a certain extent all other publications. There are in Chicago about 65 of these papers printed in Greek, Yiddish, Italian, Bohemian and almost every European language.

Naturally a large number of these foreign residents are merchants and hence are at least prospective lighting customers; and a good proportion of them could be made into power customers if pressure was exerted at the right time and in the right direction. This cannot be done through solicitors, speaking the foreign language, as the expense of getting customers in line in the first place would be too great. The logical way, therefore is to accomplish it through advertising in the papers mentioned.

Chicago, which is widely known for its large foreign population, offers a particularly good field for this class of publicity. There are no less than one quarter of a million Germans, 75,000 Greeks, and the Polish, Bohemian, Norwegian, Italian and Jewish people are extensive enough in numbers to command no little attention. In following out a campaign along these lines, the Commonwealth Edison Company is advertising in no less than fifteen papers printed in foreign languages. A few

of the most striking of these advertisements have been reproduced here. They are substantially the same as those appearing in the English papers, the argument being chiefly that electric light is cheaper, cleaner, and above all modern. This latter is particularly a strong point as nearly every foreign merchant is wide awake and wants to keep abreast of the times, when the means of doing so are explained to him in a language that he can comprehend easily and fully.

The Brooklyn Edison Company, which is also doing good work in popularizing electrical appliances, has had rather remarkable success with a folder distributed among the Chinese laundrymen. As a direct result of this piece of publicity, which describes minutely the advantages of the electric washers and tells where one may be seen in operation, a number of Chinamen appeared at the salesroom of the company with the circulars in their hands. Several washing machines were sold to these newly converted enthusiasts. There is no difficulty in tracing the benefits of such obviously good publicity.

The same company prepared a Yiddish circular setting forth the reasons why electric power is better than the gas engine, and listing a number of garment manufacturers who have discarded gas engines in favor of electric power. A list of this kind would undoubtedly have a good deal of weight among other manufacturers of the same nationality. Electric power, with the aid of such progressive manufacturers, has done a great deal towards abolishing sweat-shop conditions in New York City.

The New York Edison Company, which might be expected to take a prominent part in such work, is now advertising in 22 foreign-language papers, not counting German papers. The familiar Edison pictures play an important part and make a combination that is striking, to say the least. It is the practice of the company to run the same advertisement in the German papers as is used in the English ones, having the reading matter translated into the language by the staff of the paper itself. In all other papers, copy is changed only once a month.

Dobry nabytek dla ofisu lub fabryki.
W chłodnej pracowni robotn cy pracują z większą energją i chęcią. Z tej przyczyny ulokowanie elektrycznego wachlarza okaże prawdziwe rezultaty w książce zysków. Pędzenie wachlarza elektrycznego kosztuje mniej niż centa na godzinę — wiele fasonów do okazania po najrozmaitszych cenach
Elektryczne wachlarze również do nabycia w elektrycznej fabryce, Michigan i Jackson Blvds., i przy 9168 So. Chicago Ave.
Telefonujcie Randolph 1280
Commonwealth Edison Company
120 West Adams Street
Ez vonzza a vevőket.
Helyezzen el egy vagy két villanyos legyezőt az üzletébe, a hol a hüsitő levegőt a vevői élvezhetik. A vevők ezen kényelmükre irányzott figyelmet nagyon megköszönik — az ületi forgalom nyárón át is jobb lesz Egy villanyos legyező nem kerül többe, mint egy centbe órán ként. Különféle minták vannak az Electric Shop-ban, Michigan és Jackson Blvd. sarkán kiállitva; jutányos árak.
Telefon: Randolph 1280.
COMMONWEALTH EDISON COMPANY
120 West Adams Street
Chicago, Ill.
Gute Geldanlage für Werkstatt und die Office.
In der kühlen Werkstatt arbeiten die Angestellten mit größerer Energie. Deshalb wird der Ankauf eines elektrischen Fächers wirkliche Resultate auf der Gewinnseite des Hauptbuches aufweisen. Derselbe kostet im Betrieb stündlich noch keinen Cent Bei uns findet man zahlreiche Arten zu den verschiedensten Preisen.
Elektrische Fächer werden auch im „Electric Shop" verkauft, Ecke Michigan Boulevard u. Jackson Boulevard u No. 9163 Süd Chicago Av.
Man telephonire Randolph, 1280
COMMONWEALTH EDISON COMPANY
120 West Adams St.

Advertisements of Commonwealth Edison Company in Foreign Languages.

The large companies mentioned here are finding newspaper advertising in these foreign papers to be profitable in a good many ways. Besides influencing many readers directly, each paper exerts a wide influence through its editorial columns. The opinion of a colony are formed to a large extent through the columns of its favorite publication and the position of the operating company is thus strengthened to a considerable extent.

וויא צו קריגען מעהר ביזנעס
The New York Edison Company
At Your Service
Phone Worth 3000
Kako ćete dobiti više posla
The New York Edison Company
At Your Service
Phone Worth 3000

Advertisements of New York Edison Company.

There has been a lively demand for electric fans this summer in Formosa. The central station, which is located at Taihoku, is operated by the Government.

CREMATION AND IRRIGATION WITH CENTRAL-STATION SERVICE.

By R. B. Mateer.

Cremation, a reverent, sanitary and offenseless method of disposing of the human body, of returning to the elements the atoms of which it is composed, was first conceived of by F. J. LaMoyne for the incineration of his own body. Now crematories are located in all of the leading cities. One which is in almost daily operation is that owned by the Riverside Cemetery Association of Denver, Colo.

The rapid increase in the number of cremations by reason of educational influences overcoming the ignorance concerning the human body, its composition and process of decomposition after burial, warranted some investigations of a quick, reliable means of operating the pumps, blowers, etc., necessary for the production of a high temperature in the retort.

To understand incineration and the possibilities for central-station service, a brief account is given of the process of disintegration and the mechanism in use at this crematory.

The casket carried by the bearers is placed upon the movable pall in the chapel from where, after religious services, it is rolled into the preparation room. Here, in plain view of all persons assembled, the casket containing the body is silently and gently pushed in the opening of the retort and the door is closed. The eye, ear or nostril is not conscious of the work that follows.

Fig. 1.—Porcelain-Lined Retort.

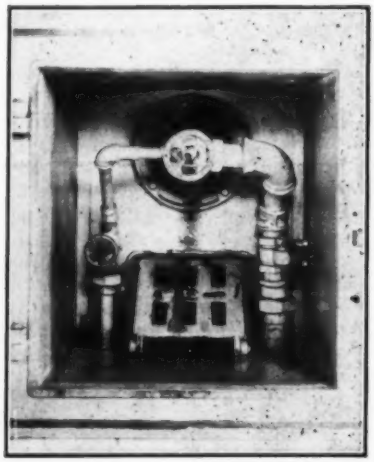


Fig. 2.—Oil Burner.

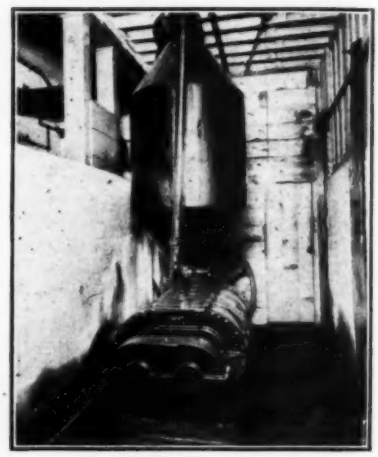


Fig. 3.—Pressure Blower.

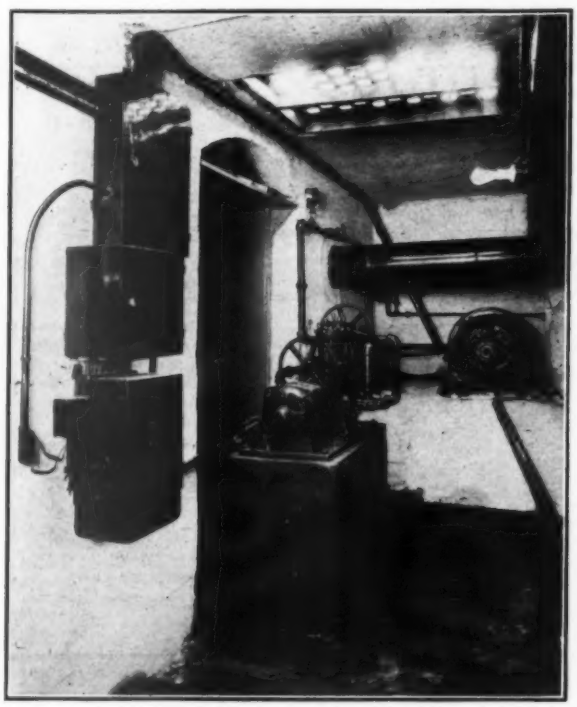


Fig. 4.—Oil Pump and Motor for Blower.

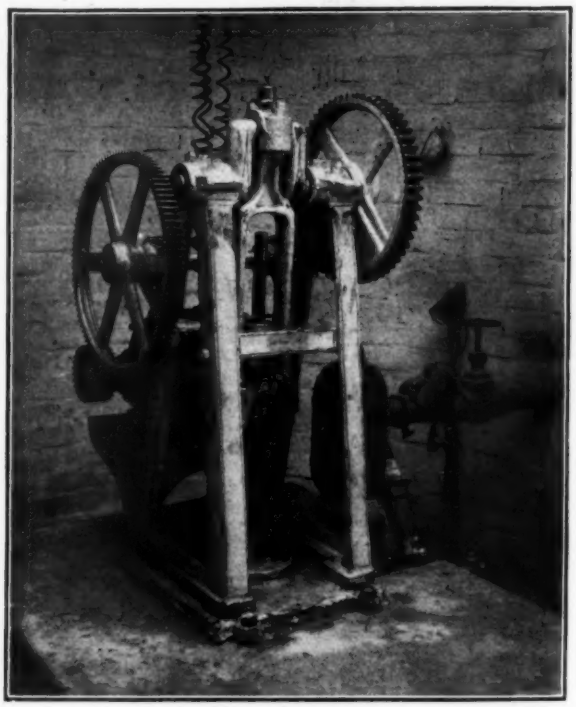


Fig. 5.—Deep-Well Pump.

In the basement of an adjoining room the switch is closed and a 25-horsepower, 220-volt, three-phase, 1,200-revolutions-per-minute motor, belted to a size 3, Root's rotary pressure blower, operating at 150 revolutions per minute, soon produces a pressure of 1.5 inches. Then a second switch is closed, and a 2-by-3 Gould triplex pump, direct-con-

nected to a two-horsepower, 220-volt, three-phase, motor of 1,200 revolutions-per-minute, supplies the necessary oil under a pressure of forty pounds.

The oil is forced into the retort at a temperature of 100 degrees and under a pressure of forty pounds; the air at 1.5 inches of water. This produces atomizing and quickly generates gas in immense volumes.

The retort in the thirty minutes previous to incineration is heated to a temperature of 1,000 degrees Fahrenheit. This is quickly raised to 2,500 degrees without smoke, odor or noxious gases. The intense heat soon reduces the body to ashes, from one to one and one-half hours being required for complete disintegration.

The liquids, which compose about 70 per cent of the body, are evaporated by reason of the intense heat. The solid matter is reduced to a few pounds of pearl-white odorless ash, varying from four to eight pounds according to the size of the person.

In a few, brief moments is accomplished by exactly the same process, scientifically applied, that nature takes years to complete.

The ash, inclosed in a metallic urn, is placed in a columbarium or interred in a plot of earth mantled with green grass and flowers.

Artesian Water.

Water for both drinking and irrigation purposes is needed in grounds devoted to the interment of the dead. Prior to the extension of polyphase electric lines to these places (which are usually remote from densely populated habitations), oil-operated combustion engines or steam installations were used to secure it.

Fig. 5 illustrates a two-horsepower, 220-volt, three-phase, 1,200-revolutions-per-minute, General Electric motor, direct-connected to a deep-well pump, supplying from a depth of 600 feet all the artesian water necessary for greenhouse and drinking purposes.

Irrigation.

To maintain green sward, a comfort to the eye of the living and a gracious sentiment toward those whose ashes lie beneath, water for irrigation is needed, at all times, especially through the summer season.

A steam pump formerly supplied the necessary water, but now electric power is used. A two-stage centrifugal pump, manufactured by the American Well Works Company, of Aurora, Ill., is direct-connected to a 50-horsepower, 220-volt, three-phase, 1,200-revolutions-per-minute, General Electric motor and supplies 1,300 gallons of water per minute, at a pressure of forty pounds.

This cemetery covers 80 acres.

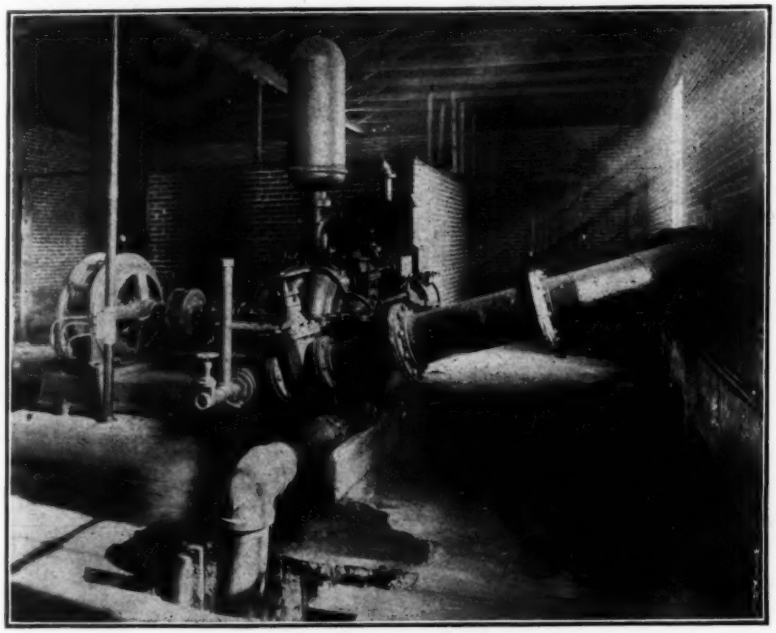


Fig. 6.—Motor-Operated Pump and Old Steam Equipment.

Advertising in Henderson.

Those who think that the smaller central stations should advertise as aggressively as their larger neighbors, though on a more modest scale, will be interested in the work of the Henderson (Ky.) Electric Company, which has begun an aggressive campaign in the newspapers there in behalf of summer electric devices. The company is not using large space, but it is pointing out, in plain and straightforward copy, the necessity of electricity as a summer comfort.

Publicity Work Brings Business and Lowers Costs.

At Bristol, England, notwithstanding an increase of ten per cent in the coal bill consequent upon the coal strike (which not only meant a higher price per ton, but also a larger quantity, owing to the poorer evaporative value, with a greater cost of handling both fuel and ashes), H. Faraday Proctor, the city electrical engineer, is able to show a reduction of five per cent in total costs. He says: "Publicity has been kept to the fore; advertising carried out on bolder lines than hitherto has resulted in a stimulating effect on the number of new consumers, the total number having increased from 3,586 to 3,883, the largest increase recorded in one year since 1904. The results from the increased work of the publicity department indicate that a still further extension of that department is desirable. Electric cooking has now reached such a state of efficiency and economy that great developments in the demand for electricity for this purpose must be anticipated and catered for."

Electric Truck Used for Demonstrating Household Appliances.

The Denver Gas & Electric Light Company is utilizing one of its electric trucks for demonstrating electrical appliances. The machine loaded with irons, toasters, percolators and other electrical devices is sent out in the residence sections of the city, accompanied by several salesmen. By connecting these appliances with the batteries of the truck the salesmen are able to give the interested housewives an actual demonstration of how they work. This is considered an effective way of selling the appliances, as the housewife wishing to see the iron or other appliance demonstrated need only step out of her front door, and therefore saves carfare and is not bothered with the necessity of dressing to go down town. In the short while the machine has been in service as a demonstrating car it has aroused considerable interest and is proving a means of disposing of a large stock of electrical appliances.

Possibilities for Sunday Load.

It is reported that the heaviest demand for gas in London, England, occurs between the hours of 11 and 1 o'clock Sunday noon, when several hundred thousand ovens in gas stoves are working "full blast" roasting the Sunday dinner. If only one-fourth of these ovens were of electric variety, quite a respectable Sunday load would be supplied by the electric central-station companies, whereas now Sunday shows the smallest daily load.

Electrical Construction

SERVICE CONNECTIONS.

Some Account of Methods Employed in a Large City.

No argument is needed to convince anyone who has had an opportunity to study electrical-construction methods in different sections of the country that there is great room for improvement in present practice in the matter of making service connections. It is pleasing to note, however, that there seems now to be a more or less general tendency towards establishing a sort of standard practice in work of this sort which will result in improved construction. In a few of the larger cities service connections are made under the direction of skilled engineers, who make a special study of local conditions, and design the service circuits and connections to meet them. Such is the case in Chicago. The following notes describe briefly some of the methods of the Commonwealth Edison Company, of this city, in the matter in question.

In Chicago both underground and overhead distribution are extensively employed, the distribution being by means of three-wire systems. In the denser downtown district direct-current power is furnished, while in the remoter parts of the city only alternating-current service is supplied, as a rule. Where overhead distribution is employed it is the practice of this company to run high-tension lines underground from the nearest substation, or power plant, as the case may be, to pole transformers located at points convenient to the areas they serve, and from these low-tension power is distributed.

In underground direct-current distribution, Edison tubes were formerly quite generally used. These consist of short lengths of iron pipe which contain the copper conductors, the tubes being filled with a compound which insulates the conductors from each other and keeps out moisture. The conductors of adjacent lengths of the tube are connected by means of short, stranded, flexible connectors and soldered lugs. The joints in the tube are inclosed in cast-iron couplings, also filled with an insulating compound. Service connections may be made with a tee connection at any joint in the line. Service tubes, and those containing the mains also, are laid in trenches in the ground just as water pipes are installed.

Fig. 1.—Old Service.

In the more recent construction Edison tubes have been displaced by lead-covered cables drawn into conduit lines consisting of ducts of vitrified clay or of other suitable material. With work of this sort service cables are tapped off either in manholes or in handholes, more frequently in the latter. The manholes are usually 6 by 6 feet in cross-section and 7 feet 6 inches deep. The walls are of brick and are 9 inches thick, while in the bottom of the manhole there is a

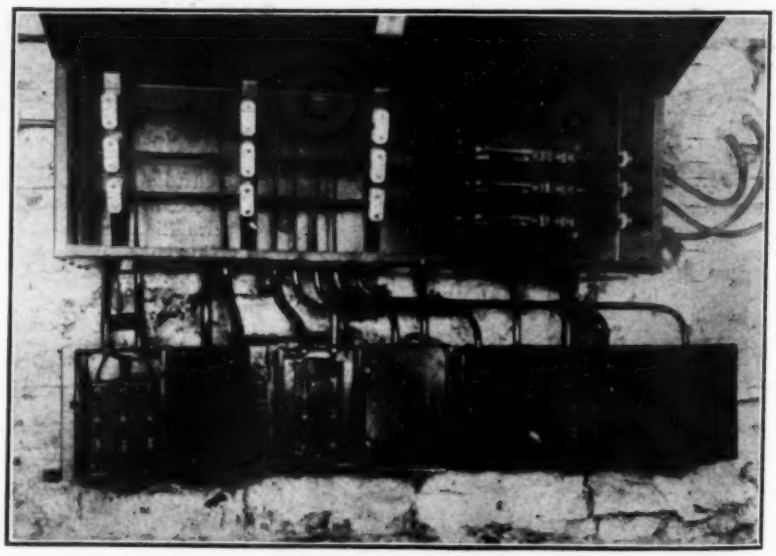


Fig. 2.—Same Service Properly Installed.

layer of concrete 6 inches in thickness. The manhole is drained to the sewer.

Handholes are provided especially for connecting service feeders. They are very similar to manholes in construction, but are smaller, the cross-section being 3 by 4 feet. In any given line of mains all the conduit ducts except the top row pass underneath the handhole. The ducts of the top row are discontinued across the handhole, so as to leave the cables exposed for taking off the service taps. From here lines of ducts are run to the walls of buildings to be supplied with power, and into these the service cables are drawn. In drawing these in wooden rods about four feet long are sometimes employed. On one end of each rod there is a hook and on the other an eye. Rods are coupled together as they are pushed into the duct from the handhole until the advancing end of the line of rods reaches the building. A rope is then attached and drawn through, and by means of this the cable is pulled in. When the distance from the handhole to the building is only 20 feet or so, however, the lead-covered cable can generally be pushed through without the use of rods.

Figs. 1 and 2 are photographs of a service on an underground distributing system. They afford excellent illustrations of the sort of construction which usually results when the proper attention is not given to the design of a large service, and the improvement to be had from skillful design and good workmanship. The construction seen in the first of the two figures, which shows how this service appeared originally, was well beyond description. As the installation is arranged now, and as it is shown in Fig. 2, the cables are run through insulating bushings into the large sheet-iron cabinet containing the main service switch and fuses Single-wire porcelain cleats support the three busses in the manner shown. The smaller cabinets in the lower part of the picture contain the switches which control the circuits supplying power to the different customers in the building, the conductors being run from the large cutout cabinet to the smaller ones in conduit. Thus a compact, safe and neat looking installation is secured. The door of the large cabinet closes by gravity, of course.

Fig. 3 is a photograph of a piece of work in a district where distribution is by means of primary alternating-current overhead lines. The construction on the pole shown in the cut possesses a number of interesting features. Electric power at a pressure of 2,300 volts is brought up the pole from a neighboring manhole. The upper portion of the iron pipe through which the lead-covered cables are run up the pole is shown in the figure. Leaving the vertical pipe, the cables are carried to potheads, the connections to one of which are shown rather clearly near the top of the pole. This pothead, which is made by the G & W Electric Specialty Company, of Chicago, consists of a porcelain sleeve which serves to seal the end of the cable insulation from moisture when filled with the proper compound, and a porcelain cap which fits over the top of the sleeve with sufficient overlap to prevent water from entering at the top. As the photograph shows, the potheads are fastened to the side of the cross-arm by means of metal cleats or pipe straps. The cable passes into the pothead at the bottom through a suitable bushing and the weatherproof wire leaves it through a hole in the cap, which hole is filled with compound and covered with tape after the wire is brought out. Pulling the cap off disconnects the circuit while pushing it back into place re-establishes connection. From the potheads the circuit runs to the overhead primaries supplying the pole transformers.

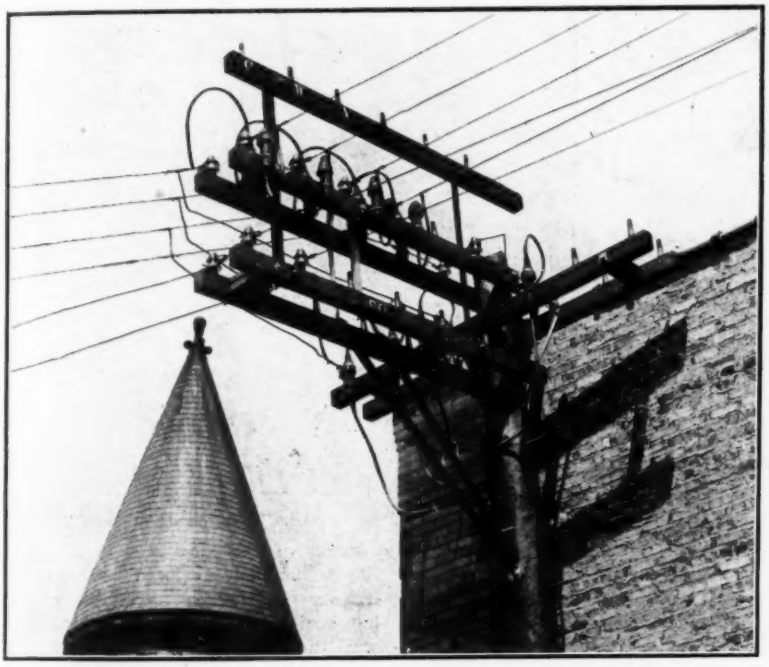


Fig. 3.—Junction Pole Between Underground and Overhead Circuits.

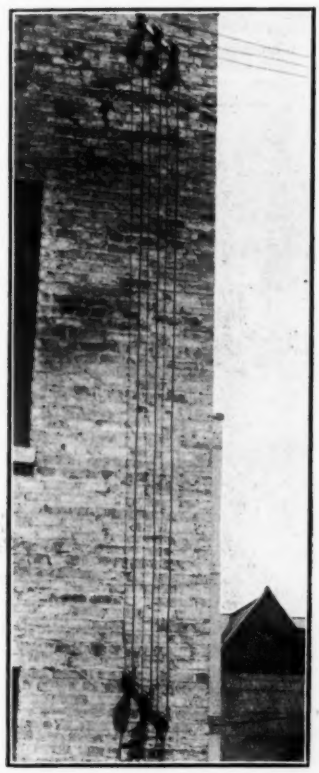


Fig. 4.—Service Run to Cutout on First Floor.

The pipe through which the primaries are run from the manhole is either filled at the top so as to exclude moisture, or else it is installed so as to drain freely into the manhole where the mains are tapped. If water is allowed to accumulate in the pipe, there is liable to be trouble due to its freezing and thus causing damage to the insulation of the lead cables.

Fig. 3 is also interesting as showing a substantial method of installing cross-arms in a place where the space for these is limited and where the

number of circuits to be accommodated is large. While this sort of construction requires a more substantial setting of the pole than is necessary where the cross-arms are installed in the more usual manner, the resulting saving in space makes its general adoption necessary for overhead distribution in a large city.

In the installation shown in Fig. 5 the two transformers on the right are connected in open delta to feed a low-voltage three-phase power circuit, while the remaining unit supplies current to a three-wire single-phase lighting circuit. Fig. 6 is a photograph of an unusually neat job of installing and connecting up a single transformer.

In making service drops, care should always be taken to keep the wires far enough from the ground to insure their being permanently out of the way of any ordinary work which may subsequently be done below them, and they should reach the wall of the building to be served at such a height as to make it improbable that anything will be dropped or thrown on top of the wires, and should be kept as well out of reach of windows and the like as is practicable. Fig. 4 shows one way of accomplishing these results. The wires are carried to the wall well above the upper window and dropped vertically to the point where the service passes through the wall, the service being run through in conduit equipped with a suitable terminal fitting. When the service switch is located in the basement of the building, and current is supplied from an overhead circuit, it is customary in Chicago to run all the way down and through the wall and in to the switch in an uninterrupted line of conduit.

A still further practice in the matter of making service drops, though it may appear very simple to some readers, is well worth mentioning, in conclusion. The use of strain insulators in getting the service wires away from the cross-arm is referred to. When it is attempted to take each wire off from an insulator on a pin, as is quite generally done in overhead work, it frequently happens that there is difficulty in finding room for a sufficient number of pins. A very satisfactory way out of this difficulty is to fasten strain insulators to the cross-arm by means of wires wrapped around the arm. To the opposite end of each one of these insulators the end of a service wire may be attached, connection being made to the service wires by the use of short taps extended to the distribution circuits. This arrangement often makes it easy to secure a good job where otherwise it would be impossible.

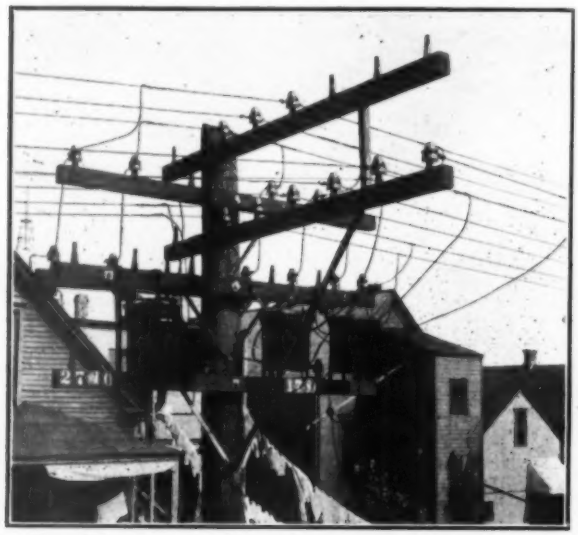


Fig. 5.—Installation for Lighting and Power Circuits in Overhead Distribution.

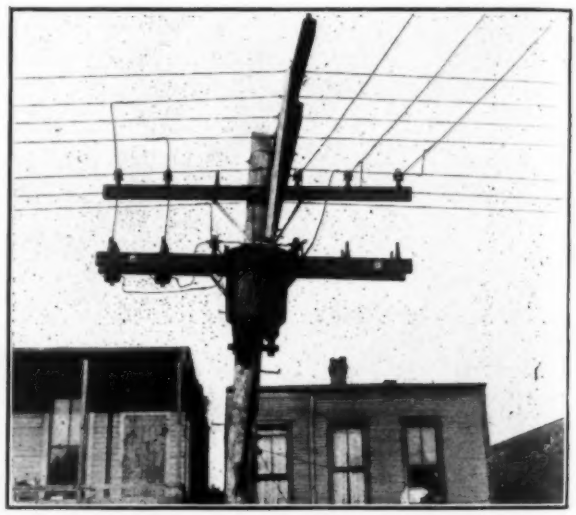


Fig. 6.—Good Construction in Transformer Work.

The work of the kind dealt with in this paper is done for the Commonwealth Edison Company under the direction of Harry B. Gear, the company's engineer of distribution, to whom acknowledgments are due for courteous assistance in collecting the foregoing data.

Wiring for Lights in a Clothing Factory.

The design of circuits and arrangement of lights outlined in the following description, which is furnished by a man who has had long experience in manufacturing clothing and has made a special study of the best methods of wiring for supplying lights for this sort of work, may be used with either the old trough-top or with the flat-top table with equally good results. As described here, it is for a double table, but it can easily be changed to suit a single table.

From the distribution center in the room, conduit is run to the ceiling of the room below, and from the point where the conduit reaches the ceiling feeders are run to the separate circuits for lighting the various rows of tables. In order to avoid overloading the branch circuits and to insure convenient control of the lamps, it may be necessary to divide the circuit for lighting a row of tables into several parts.

When a point on the ceiling directly under the center of a lighting circuit is reached, conduit is run up through the floor, and extended upward about 16 inches above the top of the table. The conduit should pass through the center line of the width of the table, the proper bends being made to carry it past the shaft. Along this center line, and above it, a 2-by-4-inch timber, with the greater dimension horizontal, is run the whole length of the row of tables, the timber being supported from the floor by means of angle irons passing upward through the table, and care being taken to leave sufficient clearance between iron and table to prevent any vibration of the latter being transferred to the former.

Along the under side of this timber conduit is run, and a two-way condulet installed between each two machines. On the top of the timber a small block is placed for supporting a wall bracket. This bracket should be set in a vertical position and should be of the double-adjusting type, with the arm nearest the wall plate about 12 inches long, and the other 5 inches long, without the socket.

With this type of bracket the lamp

can be adjusted horizontally, and there are two vertical adjustments possible. The light with this bracket on a regular width table, and a regular machine, can be thrown anywhere the operator desires—side, back, over or in front. For a machine which must be set out from the table, take out the long arm, and replace it with a still longer one, but do not change the short arm, as it is very desirable to be able to get the angles made possible with the short arm but which are not possible with a long arm on the outward end.

The use of the timber for supporting the conduit is better than running the conduit without it, since it insures stability. Moreover, the top of the timber is a good place for thread stands.

Dividing the circuit lighting a row of tables up into several parts insures economy, since this makes it easy to turn out the lights by means of the proper switch on a section of the row not in use.

Between the condulets and the brackets there will always be a small amount of exposed wiring, but this has not been found especially objectionable.

The effect of this system is very beautiful, and when lights are not needed, they are turned on the swivel which attaches them to the wall bracket, back along the side of the 2-by-4 timber, where they are protected and are also entirely out of the way. The small lights referred to only supply local illumination on the tables, of course. The writer has found arc lamps very suitable for supplying whatever general illumination is needed.

New Ordinance Relative to Electrical Construction in Portland.

On August 5 there went into effect in Portland, Ore., a city ordinance concerning electrical construction within the city which possesses a number of features which should prove especially interesting to readers having to do with this sort of work. It is interesting, too, to note that the ordinance was written by a committee on which there were representatives of all the electrical interests in the city. The committee meetings which resulted in the formulation of the ordinance were presided over by F. D. Weber, electrical engineer for the Underwriters' Equitable Rating Bureau, of Portland, and local representatives of the following bodies were present: American Institute of Architects, National Electric Light Association, National Electrical Contractors' Association, and the American Institute of Electrical Engineers; also representatives of the electric fixture men of Portland, the Underwriters' Equitable Rating Bureau, and the Pacific Telephone Company. The city building inspector and the city electrical inspector likewise participated heartily in the meetings, of course.

The new ordinance is given in part below. It should be pointed out that this ordinance was passed as an amendment to a previously existing ordinance, which explains the numbering of the sections shown in the following:

Section 767. Every person, firm or corporation engaged in conducting the business of placing or installing electrical wires, appliances or apparatus, or construction in or on buildings in the City of Portland, shall appear in person or by duly authorized representative at the office of the Department of Buildings and shall there register his name and place of business in said City and make affidavit that such names and place of business as thus registered are correctly stated, and thereupon shall be entitled to a certificate of registration from said Department; provided, that no such certificate shall be granted for more than the period of one year or portion thereof unexpired.

It shall be unlawful for any person, firm or corporation to engage in conducting the business of placing, or installing electrical wire, appliances, apparatus, or construction in or on buildings in the City of Portland, without first obtaining a certificate of registration from the Department of Buildings, and said certificate must be renewed as herein provided for within thirty days after the first day of January of each year.

Section 768. Every person, firm or corporation engaged in conducting the business of placing or installing electrical wires, appliances, apparatus or construction in or on buildings in the City of Portland, before registration, shall execute a bond to the City in the sum of $500 with good and sufficient security for the faithful compliance with the provisions of this ordinance, and said bond shall be approved by the Mayor and filed with the City Auditor.

Section 770. In order to procure a permit for the installation of electrical wiring the said companies, firms, co-partnerships, corporations or individuals shall, before having any electrical work commenced or any addition made to old wiring, make written application to the Department of Buildings, and shall pay the City Treasurer, as a fee, the amount as required by the following schedule:

For electric light installation, for each outlet of 250 watts or less, where current is issued or controlled, 5 cents.

Outlets in excess of 250 watts shall be considered as one outlet for each 200 watts or fraction thereof, said outlet issues or controls.

For power installation:

For each unit, 25 cents, and an additional charge of ten cents for each kilowatt of horsepower capacity or fraction thereof; horsepower being applied to motor installations and kilowatt to generator installations.

For installation, alteration or extension of new or old fixtures, same charge will be made per receptacle on fixtures as specified in the above schedule applying to outlets, except that when cord drops are hung in connection with exposed wiring of not more than three drops, one permit may be issued for both outlets and cord drops without extra charge for said drops. The word "fixtures" as used above shall be construed to mean any receptacle for the reception of any electrical device. The term "cord drops" shall be construed to mean cord drops and sockets, or socket and receptacle alone. This does not apply to flush receptacles.

In estimating the cost of the permit, the same shall be taken to the nearest fifty cents, and the minimum fee shall be fifty cents.

For each electric sign a rate of one dollar will be charged when the total number of lamps used does not exceed forty and one dollar per hundred or part thereof in excess of forty sockets.

Inspection for temporary installation for show windows, exhibitions, conventions and the like shall be charged for at the rate of one dollar for the first forty sockets, and fifty cents per hundred thereafter in excess of forty sockets.

In inspection of electrical apparatus for which no fee is herein prescribed a fee may be charged of not exceeding seventy-five cents per hour for the time actually consumed by each inspector in making the inspection.

Section 771. The Chief Inspector of Electricity shall be notified in writing by the person or persons doing work, first when roughing in work is completed, and again when the entire work is completed, in both cases within forty-eight hours after the completion of said work. The Chief Inspector or his deputy shall proceed to inspect the same within forty-eight hours, not including Sundays or holidays, after receipt of such notice, and if said work is in all respects in conformity with the provisions of this ordinance he shall attach a notice giving permission to proceed with the installation. Should the Inspector condemn any of the said work or equipment as not being in accordance with the provisions of this ordinance, such rejected wires or equipment shall at once be removed and changes demanded by the Inspector or his deputy shall be made by the electrical contractor within a reasonable time after written notice is received by him so as to bring the same up to the requirements of this ordinance. In default, said electrical contractor shall be liable to the penalties of this ordinance, and any and every lather, carpenter, mason, electrical contractor, owner, agent or any other person covering or allowing to be covered such portion of work or equipment so condemned, or removing any notice not to cover same placed thereon by the Chief Inspector of Electricity, or his deputy, shall likewise be liable to the penalties of this ordinance. Failure of the Chief Inspector of Electricity, or his deputy, to make inspection as prescribed above within forty-eight hours will be construed to mean permission to the lather, carpenter, mason, electrical contractor, owner, or agent to proceed with the construction of the buildings.

Section 774. It shall be unlawful for any electric light or power company to do any wiring of any nature in or on any building, except their own power house or substation, for which a permit has not been issued, or to make any electrical connections to any building until a certificate of inspection of said building has been issued by the Chief Inspector of Electricity; provided, however, that the Chief Inspector of Electricity may issue a temporary permit for the use of electric current during the construction or alteration. No charge is to be made for this temporary permit.

Section 777. All electrical wiring and appliances in or on buildings inside of the city limits of the City of Portland

hereafter erected, altered or repaired, shall conform to the National Electric Code, Edition, 1911.

Section 778. The following local rules shall apply to electrical installation for light, heat and power in or on buildings in the City of Portland and to be in addition to the electrical code as set forth in Section 777:

(a) All electrical installations in buildings which are hereafter erected, altered or repaired in the inner fire limits shall having wiring encased in approved metal conduit, provided extensions to existing installations, not installed in conduit, may be made in a manner similar to the existing installations, provided the extension does not require any new circuit or circuits.

(b) All electrical installations in basements in buildings which are to be hereafter erected, altered or repaired, in the outer fire limits, unless concealed, shall have the wiring incased in approved rigid or flexible conduit. Installations made in wood or metal moulding not to be construed to be "concealed work." This shall not apply to buildings which are occupied by four families or less.

(c) All buildings hereafter erected, altered or repaired to be used as public garages shall have their electrical wiring incased in either rigid or flexible conduit.

(d) The ends of all wires at outlets, where fixtures are not installed, must be taped and provided with approved outer covers.

(e) All wiring for signs must be in conduit. For swinging signs conduit must extend to sign axis and terminate in an approved water-tight fitting; from this fitting wires to be neatly cabled, and where the wires enter the sign structure they are to be properly bushed. If sign is of stationary construction, conduit must enter sign structure in approved manner.

(f) Conduit work on outside of building must be water-tight; socket and receptacles must be weatherproof.

(g) Wiring on outside of building must be incased in conduit.

(h) Conduit must be installed so that it will not be necessary to leave fish wire in same in order to pull in conductors.

(i) All outlet and junction boxes, condulets, unilets, pipe ends and fittings of similar make must always be accessible and must not, under any circumstances, be concealed, and must be secured with screws not smaller than No. 8.

(j) On conduit jobs all necessary cutouts, cutout cabinets, switches and other material and devices must be installed and all outlets properly connected before any certificates of final inspection will be issued.

(k) All conduits must be double locknutted to cabinets, outlet boxes, junction, pull and switch boxes.

Section 779. (a) At three-way and gang switches, taps must be made and secured outside of boxes.

(b) Wires must not run diagonally through joists, studding or timbers.

(c) Wires must be knobbed at top and bottom of partition; that is, just above mud tubes and below the plates.

(d) Broken tubes or knobs must not be used for mud tubes.

(e) All tap wire must be knobbed within six inches of tap.

(f) In attics which are reached only by scuttle hole wires must be kept at least five feet from scuttle, or be considered as subject to mechanical injury.

(g) Do not knob on one-inch header block at outlets.

(h) Avoid running wires under bathrooms or near sinks wherever possible.

(i) Joints must be properly made; must be heated sufficiently to allow the solder to flood same, then covered with two thicknesses of rubber tape and at least two thicknesses of friction tape.

(j) Where metal lath or metal ceiling is used outlets must have approved outlet boxes. Open work, knob and tube or cleat work on grounded surfaces, such as metal lath or metal ceiling, is prohibited.

Section 780. (a) All buildings having their electric service either from overhead or underground service must be fed separately; that is, one building must not be fed through another unless the connection is made by conduit and the conductor carried on outside of building or buried in six inches of concrete or brick. This permission is given only by a written order from the Chief Inspector of Electricity.

(b) In buildings containing more than one tenant all services must be brought to one distributing center.

(c) No wire smaller than No. 12 B. & S. gauge may be used for service.

(d) Service wires for all buildings must be installed in conduit from a point ten inches beyond outside wall to and entering iron cabinet for main service cutout.

(e) All knife switches and cutouts must be installed in approved cabinets.

(f) No fuses, switches or meters must be mounted on back of switchboard. Where such a design is intended, the above apparatus should be mounted on sub-panel at the rear of the switchboard.

Section 782. Wooden moulding for electrical wiring is prohibited inside the fire limits, except as set forth in Section 778, (a) and (b). Soft wood moulding for electrical wiring is prohibited within the city limits of Portland.

Section 783. Wires carrying current in excess of 600 volts are prohibited in buildings, except for motors and transformers.

Motor installations above this voltage must conform to the following specifications:

(a) On pole outside of building locate three transformer fuses as starting fuses, isolated from all combustible or inflammable materials.

(b) All wiring must be done with approved multiple conductor metal sheath cable in approved unlined conduit.

(c) All wiring around switchboard must be done with approved rubber insulated wire. This wire must be of approved make for this potential—ordinary 0 to 600 volt wire is not approved.

(d) All open wiring must be supported on porcelain insulators at least 1 inch high, and wires must be 8 inches apart.

(e) Use bushings on the ends of all conduit as a terminal fitting. Do not use outlet boxes or condulets.

(f) No iron cabinets can be used. Use wood—slate or marble lined—that is, build the cabinet of wood.

(g) Wherever lead-covered cable leaves conduit, place a pot head on the lead-covered cable and fill it with asphaltum so as to separate wires. This pot head should be at least twice the diameter of the metal sheathed cable.

(h) Inclose the motor in a dustproof room when direct current motors are used.

(i) Place the starting panel in the motor room; also the auto starter and the oil switch. If no room is provided one must be built for this apparatus.

(j) Ground thoroughly the motor frame, the conduit and the metal sheathed cable. This grounding to be done with approved clamp.

(k) On the outside of the building the conduit must be turned downward with a bushing on the same and a pot head must be used on the lead-covered cable.

(l) Connect the starting terminals of the compensator between the oil switch or fuses on outside pole and circuit breaker on the starting panel, making the circuit breaker on the panel the "Running Fuses."

(m) If it is necessary to dead end to the building, place several strain insulators in series.

(n) Motor must be so located that it will be readily seen from the auto-starter.

NUMBER OF OUTLETS PER CIRCUIT.

Section 784. The maximum number of outlets per circuit, provided not more than 660 watts are consumed, shall be as follows:

For stores and offices if more than three feet apart..... 6 outlets
In buildings not mentioned above—For concealed work .....12 outlets
For open work.....12 outlets
For signs and outlining the outside of buildings .....66 outlets

is the maximum number, except signs wired in series-multiple; for lamps of five watts or less maximum of 200 sockets shall be allowed.

Section 785. In low-voltage transformer, when the highest voltage of either primary or secondary does not exceed 550 volts, and the apparatus that constitutes the load is capable of carrying over one ampere, both the primary and secondary wiring must be installed according to Class "C" rules of the National Code.

When the secondary current does exceed one ampere at twenty-four volts, and is used for signalling work, the secondary wiring may be installed according to Class "E" rules of the Code.

Section 789. This ordinance shall not be construed to relieve from or lessen the responsibility of any person owning, operating or installing any electrical wires, appliances, apparatus, construction or equipment for damages to anyone injured by any defect therein; nor shall the City, or any agent thereof, be held as assuming any such liability by reason of the inspection authorized herein or the certificate of inspection issued by the Department of Buildings.

Section 790. Any person, firm, company, or corporation that violates, disobeys, omits, neglects or refuses to comply with, or resists, or opposes the execution of, or violates any of the provisions of, or who occupies or maintains any building or structure which was erected or altered in violation of this code, shall be punished by a fine of not exceeding $500, or by imprisonment of not more than six months, or by both such fine and imprisonment, and every person, firm, company or corporation shall be deemed guilty or a separate offense for every day such violation, disobedience, neglect or refusal shall continue, and shall be subject to the penalty of this section for each and every separate offense, and so much of any building or structure as may be erected or altered in violation of this Code shall be condemned and torn down at the expense of the person, firm, company, or corporation erecting or altering the same.

Trimming a Specification.

This is a matter indulged in so frequently of late, that it seems to have become a habit, and, like many habits, it is very bad. Trimming an electrical specification for the sake of initial cost is a very poor investment for several reasons, if we look ahead through the life of the structure. There is nothing which identifies a modern structure more strongly than its use of electric current. When we find a building which does not use electricity, we immediately relegate it to the dark ages and wonder if its owners "know the war is over." If this comparison is so pronounced, surely we must compare in like proportion the extent of its use.

Take for instance an apartment building. We refer to this class of structure for the reason that this class suffers most. The architect after noting roughly the desires and needs of the client, especially if he is in competition—and we might add here before we forget it that subjecting architects to competition is the worst practice in the building industry—he is called upon for an approximate figure, which he is never bashful about giving, although he may have neither detailed the work nor taken figures from contractors, and right here trouble starts. He, in giving this figure, which is never high, for fear the customer may look elsewhere or give up the idea of building, is bound to stay within the limits. He details the work to conform with actual requirements and calls for figures, which, invariably run over his estimate. The trimming is on. He can't cut the foundation, the brick or the stone work; the carpentry work must stand for the sake of safety. He can't cut the plumbing, as the civil laws have a say in that; so he finally gets down to the electrical work and proceeds to read the death warrant.

First, he cuts the switches, evidently feeling that the tenant will consider knocking over furniture, and similar other misfortunes occurring while he is locating a socket, a humorous matter. Possibly a little game of find the light could be made a national pastime. Then the baseplugs and wall receptacles go under the knife, the surgeon having the idea in mind that the rent will be so high that the tenant could not afford appliances that necessitate these luxuries. Then comes the changing from telephone to speaking tube. This is evidently done to improve the lungs of the tenants. By the time one has developed enough lung power to make himself understood through 200 feet of speaking tube, with a dozen elbows en route, he must be seriously considered in the "white hope" class. We are so elated over our saving that we again sharpen our knife, administer another anaesthetic and proceed to take out numerous outlets. Closet lights are cut, as light breeds moths. Pantry lights are cut to keep the children from eating after dark. Bracket and dresser lights are cut to assist the poor tenant in reducing this current bill. China-case and beam lights are apt to go out of date.

You may spend large sums on interior decoration, on the building itself and the tenant's furnishings, but a large proportion of it is lost if it is secluded in a darkened area of a room.

We live in an age where entertaining is largely confined to the evening hours. We furnish our homes as well as we can afford, not only for our own satisfaction and enjoyment but also to attract and please our friends and acquaintances. What good are our well chosen furnishings if they are not noticeable without using a searchlight. Take, for instance, a living room or parlor. We have pictures, carving, laces and fine ladies' handy work; also carved furniture. If this room is not well lighted, the fine points that distinguish them from common ordinary furnishings are lost, unless you haul them under your limited lighting system or draw your guest's attention to them, which is against the rules of good taste, of course. You play, or induce one of your guests to play your piano. Nine times out of ten the player sits so as to throw a shadow on the music, and must guess at about half of the notes, which aids a great deal in entertaining, to be sure. You have your camera efforts or some books in which some of your guests are interested; they must either bring them within the rays of your trimmed lighting system or fail to appreciate them.

To sum the matter up, your friends don't see anything out of common about your home, although you have tried to make it otherwise. You can't feel satisfied with the apartment, although you may not have decided the cause, and you move and move until you find some place that seems to suit, and, on thinking it over, you find that, outside of the lighting arrangements, that all apartments were practically the same.

Owners and agent are at a loss, too, as to the cause of the continued unrest of tenants. They seem to move each year, and the owners are compelled to pay commissions year in and year out to keep their apartments rented, and, even then, they are vacant at times.

Statistics show that for the months of May, 1912, in the city of Chicago, one family out of every six moved during this time. We all know that moving is not only expensive, but very inconvenient, and is only indulged in for cause.

You trim a specification a few hundred and during the life of the structure you will find that you have trimmed yourself an amount far in excess of this.

Don't build an old-fashioned structure, it will get in that class soon enough even though it is up to the minute at completion.

Don't trim a specification; because you will receive the sharpest edge of the pruning knife in the long run, and you fool nobody but yourself.

Don't be like an old man who attended a public hearing in a town to discuss the advisability of paving the streets and installing a storm water sewer. He expressed himself against improvement by saying, "I've waded through mud and water in this town for twenty years, and I can do it for twenty years more and there ain't nobody in town any better than I be." He was fighting against progress and he is a charter member of the trimmer league.

Among the Contractors.

Oscar M. George, electrical contractor, 53 West Jackson boulevard, Chicago, is putting in the wiring for 500 incandescent lamps in a new building on Thirty-first Street, this city.

Cope & Son, of Vancouver, B. C., is putting in a very modern installation of electric lighting, bells, telephones, etc, in the new eight-story Goldstein apartment house. Thirty thousand feet of conduit is required. Other work being done by this company is the wiring of the new Coleman apartment house, of forty suites, the electrical work on four new school buildings now under construction, and the wiring on the new Highland Exchange building of the British Columbia Telephone Company in Vancouver.

The firm of Kohler Brothers, 343 South Dearborn Street, Chicago, is installing 400 incandescent lamps and 8 motors in the Young Men's Christian Association building at 19 South LaSalle street, this city.

The Missoula Electric Supply Company, of Missoula, Mont., is rewiring the addition to St. Patrick's Hospital. Among other jobs done in Missoula by this company of late was the electrical work in the new C. M. & Puget Sound Railway station, and the installation at the hospital at Fort Missoula. Each one of these was a conduit job throughout.

W. B. Hillman, electrical contractor, of North Yakima, Wash., is installing the wiring in the new J. D. Keck building in Toppenish, Wash. The work on this building and that recently done by Mr. Hillman on the new Northern Pacific Railway station, are the only two conduit jobs in Toppenish.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fishing Wires in a Partition.

My experience in fishing wires in a difficult partition may be useful to others; so I am giving an account of it. After trying all sorts of schemes to fish the wires through the partition, which had an opening in the floor above and another in the floor at the base of it, I finally accomplished the task as follows. Through the upper opening, I pushed into the partition about 50 feet of ordinary annunciator wire, letting it go wherever it would in the wall. I then found it quite easy to catch one of the loops of the wire with a steel wire-snake with a hook on the end, which was inserted at the bottom opening. Pulling out the annunciator wire and fishing in the circuit wire was then but short work.

H. Piccard.

Method of Holding Wire in Wooden Molding Work.

Everyone who has installed wood molding knows how difficult it is, when put ting up runs on ceilings, to make the wires stay in the grooves until the capping can be placed and fastened, because the weight of the wires tends to pull them out of the grooves, and they usually come out if it is a loose fit.

This difficulty is overcome by some wiremen in a manner which cannot be too strongly condemned, viz., by driving small nails, brads or double-pointed tacks over the wires—a very dangerous practice, as the nails may penetrate the molding and make contact with pipes, wire, lath, etc., concealed behind it, thus paving the way for a bad ground.

My scheme is to kink or crimp the wire at short intervals, as shown in the sketch. When the wire thus crimped is forced into the molding, it binds alternately against the opposite sides of the groove and is held very securely. This can be done in less time than it takes to tell of it; it introduces no extra expense or hazards, and remedies one of the most exasperating features of wood-molding work.

H. A. Calderwood.

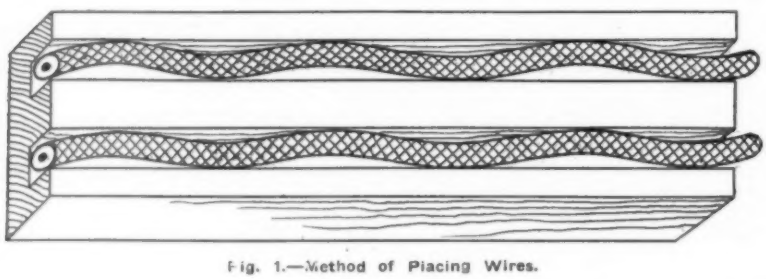


Fig. 1.—Method of Placing Wires.

Home-Made Electric Drill.

Not long ago I was called upon to wire a large book press, and the job required about 200 holes to be drilled and tapped for machine screws. As it would have been a slow job to drill all these holes with a breast drill, I made an attachment for a one-twentieth horsepower motor which we had on hand. I took a piece of a round, iron rod about 1.5 inches long, and 1 inch in diameter, and drilled a hole through it from one end to the other with a No. 23 wire-size drill, which was the right size for the machine screws which I had to use. Then I enlarged the hole at one end to make it fit the motor shaft. Two flush set-screws were fitted about three-eighths of an inch from each end to hold the attachment and drill in place. On the other end of the shaft a small steel ball was put in the center mark of the shaft and a plate fastened on the end of the motor to take up end thrust.

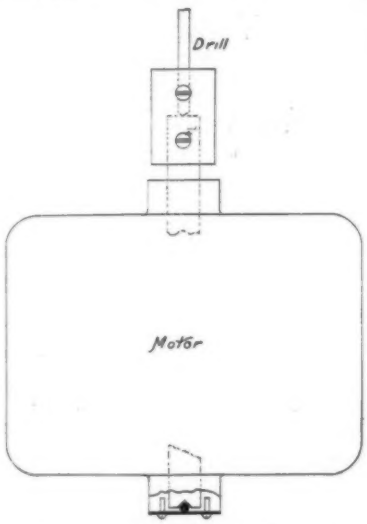


Fig. 2.—Showing Drill in Position.

The length of this arrangement was only 10 inches, and it was handy in small places where an electric drill would have been too long. Fig. 2 illustrates the completed device.

Joe Braith.

Installing Boxes.

In doing a concealed *BX* job, I had several stud boxes to place beneath tile bathroom floors. The ceiling was of plaster on laths. The tile, above, was laid on deafening which was supported by boards which were five inches above the laths. It was impossible to place a board over the outlet, and to fasten the box on the laths made a poor job.

I found that the way out of the difficulty was to cut as little laths away as possible and to use 6-inch screws. These would catch in the board above and would draw the box up tightly against the laths. In this way it was no trouble to set the boxes both firm and level.

J. Josephson.

Trimming Flaming Arc Lamps.

When working with flaming arc lamps, lamp trimmers will find that it is an excellent plan to carry with them a rather coarse, short file. With this the slag which accumulates on the ends of the carbons, and sometimes causes the extinguishing of the arc, may readily be removed. This method is superior to that of removing the carbons and cutting the slag off with the pliers.

Frank N. J. Murphy.

Making Sharp Bends in Small Pipe.

Recently while bending some lengths of pipe I had trouble in finding a conduit bender suitable for making sharp enough bends in the pipe, which was for a difficult piece of work, and had to be bent sharp and exact.

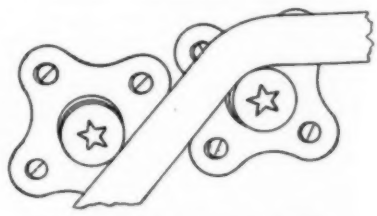


Fig. 3.—Plan of Bending Device.

I finally hit upon the method shown in the accompanying sketch.

I screwed two half-inch solid fixture stems to a beam, placing them about an inch and a half apart. I then placed the pipe between the stems and bent it in the form I wanted. A sharper bend can be made with three-eighth-inch solid fixture stems.

W. F. Dimelow.

Among the Supply Men

The Baltimore Electrical Supply Company, Baltimore, Md., was established in 1905. The company does a wholesale and retail business in Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi and Tennessee.

The Korsmeyer Company, Lincoln, Neb., does no retail business in the electrical line. The company reports business as usual, with a special demand for storage battery lighting plants. The company covers Nebraska, northern tier of Kansas, and the Black Hills of South Dakota.

The R. W. Hodge Electric Company, Kansas City, Mo., do a retail business to a small extent. This company was established in 1895, and its selling organization covers Kansas and Missouri principally, and parts of Nebraska and Oklahoma.

The International Electric Supply Company, El Paso, Tex., wholesales only in electrical lines. The officers of the company are: A. L. Sharpe, president; J. D. Campbell, secretary and treasurer; George L. Kitchens, manager. The company was established in 1907, and covers western Texas, New Mexico, eastern Arizona and four northern states of Mexico.

Garrett, Miller & Company, Wilmington, Del., retails electrical lines to a small extent. The company covers Delaware, eastern part of Maryland, upper Virginia and southwestern Pennsylvania. The company was organized in 1895, and the active members of the company are Frank S. Garrett, Henry K. Miller and Robert S. Glover.

David Aitken, manager of the electrical department of The George Worthington Company, Cleveland, O., reports things about normal, with, however, a vigorous campaign under way on "Americore" new-code rubber-covered wire. The company is erecting a 66x90 feet, six-story concrete warehouse, which will give more room for electrical supplies.

The Southern-Wesco Supply Company, Birmingham, Ala., will hold a salesmen's conference during the month. The company reports business good, with an unusual amount of building going on in Birmingham.

The C. J. Litscher Electric Company, Milwaukee, Wis., which has succeeded the Albert Smith Company, Incorporated, reports business improving generally. The company is conducting a selling campaign on electric heating apparatus, especially household irons.

The Home Electric Company, Tacoma, Wash., doing a jobbing business in electrical supplies throughout the State of Washington, has moved to larger quarters at 923 C street. The retail store of the company extends through from C street to Commerce street.

The Hatfield Electric Company, Indianapolis, Ind., has recently added a department devoted to medical and dental electrical machinery and supplies.

George W. Provost, president of the Union Electric Company, Pittsburgh, Pa., is making a trip to Canada with the Yankamuck Club. The company will hold a salemen's meeting some time this month.

The Cripple Creek Auto & Electrical Supply Company, Cripple Creek, Colo., has purchased the electric shop from J. C. Corsen, and the Arkansas Valley Railway, Light & Power Company. The Cripple Creek company, according to Roy Wright, expects to continue the electric shop in the present quarters for awhile, and to run this in connection with the auto and electric-supply business. The company does a general electric business, both in Cripple Creek and throughout the Cripple Creek district, in wiring, motors and mine supplies. Mr. Wright states that the company is now open for a few more agencies for supplies and apparatus for the Cripple Creek district.

L. T. Digby, until recently salesman for Indiana territory with the Mills Electric Company, Peoria, Ill., has accepted a position as new business manager for the properties owned by the Middle West Public Service Company, with headquarters in Charleston, Ill. The Mills Electric Company is pushing "Local Option" batteries for telephone and ignition service, and reports business active in central Illinois. There is also a good demand for line material and high-tension apparatus.

S. B. Howarth, vice-president of the St. Paul Electric Company, St. Paul, Minn., with his family, is spending the month of August in the East, combining business and pleasure. B. B. Downs, president of the company, report an increasing demand for supplies in general, with activity most apparent in Cracraft-Leich telephones, for which the company is distributor in Minnesota, Wisconsin, North Dakota and South Dakota.

M. B. Austin & Company, Chicago, have taken over control of the sale of the Gem lamp-cord adjuster for the United States. More than 6,000 of these adjusters have been installed in the works of the International Harvester Company; about 3,500 in the tanneries of Pfister & Vogel Leather Company, and over 1,100 in a big brewery. The company is making an agency proposition to live wires. The M. B. Austin Company is mighty busy with a number of its lines, particularly Safety wires and cable, and Galvaduct conduit. Among the cities installing ornamental lighting systems, for which the company is supplying Safety steel-taped cable, are St. Joseph, Mo.; East Grand Forks, Minn.; Fairbury, Ia.; Lowell, Mich.; Salem, Ind.; Clinton, Ind.; Bedford, Ind.; Coldwater, Mich.; Kansas City, Mo.; Crawfordsville, Ind.; Kearney, Neb.; Caspar, Wyo.; Ludington, Mich.; Great Falls, Mont.; Springfield, Ill. The *Austin Post*, issued monthly by M. B. Austin & Company, is a very interesting, newsy and instructive bulletin of events of interest to electrical men.

Supply Jobbers' Meeting at Niagara Falls Next Week.

The midsummer meeting of the Electrical Supply Jobbers' Association will be held at the Clifton Hotel, Niagara Falls, Canada, August 14, 15 and

16. There will be no formal program, no outside speakers having been invited to address the members. Latest reports indicate a good attendance. The Western delegation has arranged to fill two cars, leaving Chicago over the Michigan Central Railroad, Tuesday, August 13, at 5:40 p. m.

Frank H. Stewart Company Opens New Building.

With the opening of the new building of the Frank H. Stewart Electric Company at 37 and 39 North Seventh Street, Philadelphia, Pa., a new chapter is added to the already long and intensely interesting history of the historic spot upon which it is built. The old set of buildings that stood on the spot of their recently built home and which was used for many years as their place of business by the electrical people, was the first mint of the United States and was built chiefly because of the active interest of the first president, George Washington, in regulating the currency of this country and it was with silver presented by him that the first silver dollars were made.

The tract of land of which this site is a part was the original grant of the King of England to William Penn and was deeded by him to the Pennsylvania Land Company, consisting of Tobias Collett, a haberdasher; Michael Russell, a weaver; Daniel Quare, a watchmaker, and Henry Goldney, a linen-draper. The deed was signed by the immortal Penn and was stamped with two six-penny stamps, the official seal of that time. The consideration was two thousand pounds or about ten thousand dollars in American money. The land company held possession until 1785 when it was disposed of at private sale to Daniel Roberdeau, who in 1789 conveyed the property to Richard Farmer, a practitioner in physics. One year later Michael Shubart opened a distillery on the site of the electrical house. The ground then passed several ownerships until in July, 1792, by order of Congress, the President purchased it and appointed David Rittenhouse superintendent of the mint, and he directed the tearing down of the distillery and the erection of the structures which were to constitute the United States Mint. Three coining presses arrived in September and the mint was in operation one month later. Forty-four years later, in 1836, the mint buildings were abandoned and were transferred to a bell hanger, by name Michael Kates, who for many years conducted his business there and expanded into all electrical repairing work. In February, 1894, the old mint buildings were purchased by the Stewart Electrical Company, and were used by them up until about one year ago when the two front buildings gave way to the magnificent new home which they are about to open. The old coinage house in the rear of Seventh Street is still preserved along with many of the relics that were unearthed in the excavations recently made for the new building.

Among these relics are many things that recall odd incidents for instance in the basement of the remaining building there was found a "burglar proof" vault, consisting of two caves, one within the other, with brick walls held together by thick wooden joists. These were most probably used to safe-guard the nation's reserve wealth. In the crumbled portions of the walls were found several of the first coins that were ever stamped. There is tradition that during the War of 1812 the chiefs at the mint became alarmed at the actions of the British soldiers in destroying the government buildings and walled up their coin and when the war was over neglected to get get all of it out.

The new building of the Stewart Electric Company is of steel, concrete and brick, and is provided with the best fire-protection that can be found. The architecture ranks among the best in Philadelphia. Strength, utility and beauty, without extravagance, have been combined in the erection of the building and the installation of its equipment. The weight capacity of the floor is sufficient to load a freight train a mile long, 30,000 pounds to the car.

New Home of the Frank H. Stewart Electric Company, Philadelphia, Pa.

At a recent meeting of the electrical supply manufacturers in Philadelphia there was a long discussion of the effect of the political campaign upon the industries and the almost unanimous opinion was that it had not effected their line in the least. This industry has been constantly growing in Philadelphia for the last ten years and as seen by the last census ranks among the first cities in the United States.

Public Service Commissions

WISCONSIN.

The Wisconsin Railroad Commission has found that the rates now charged by the Ashland Home Telephone Company are sufficient to yield but 2.6 per cent on the reproduction cost of the property and that therefore, an increase in revenue is justifiable. The schedule as petitioned for was not granted, however, because of the unreasonably high rate of return which it would produce. The Commission ordered that the present single-party residence rate be increased from $1.00 to $1.60 a month, and that two-party and four-party service be introduced at rates of $1.35 and $1.10 per month respectively. The new rates are designed to yield a 7-per cent return on the cost new and to allow for a 6.5-per cent depreciation fund. In a decision recently announced, the Commission held that the service rendered by the Rockford Interurban Railway Company was in substantial agreement with the terms of the franchise, and dismissed the complaint of the city of Janesville. The complaint alleged that citizens in a certain portion of the city were considerably inconvenienced by reason of the suspension of service in that section, but the Commission found that, through arrangements which had been made between the interurban and the city traction lines, the service was now reasonably adequate. In reference to a portion of the complaint alleging inadequate service in general, the Commission ventured no opinion, but this matter is to be investigated in connection with a subsequent proceeding.

The Commission has issued an order authorizing the village of Whitehall to increase its rates for commercial lighting and to increase its rate for street lighting from 25 cents per lamp per month to 40 cents. The Commission has refused to grant the petition of the Bruce Water and Light Commission for an increase in power rates, but supplied the relief sought for by re-classifying certain of the power consumers. The municipality was ordered to discontinue the present practice of discriminating against consumers not owning their meters in the matter of the minimum monthly charge.

The Eastern Wisconsin Railway and Light Company has been authorized to issue $92,000 of 5-per-cent, twenty-year, first-mortgage bonds, to provide funds to pay the obligations incurred in making improvements to the property and to pay for subsequent improvements and additions.

OKLAHOMA.

In view of the fact that the company is now in the hands of a receiver, the Corporation Commission refused to take any action on the complaint of C. D. Johnson against the Hobart Light and Power Company, asking for a reduction in rates. It is indicated that the matter may be taken up again when the company's financial affairs get in better shape. The company has been charging 16.2 cents per kilowatt-hour. The Commission holds that this is a very high charge, but also finds that the company's expense has been unusually high. The greatest element in the expense is the item of fuel and it is stated that an unusual amount of coal is required because of the large amount of gypsum in the water. It is also suggested that the fuel costs may be decreased when the new freight rates on coal proposed by the Commission shall become effective.

The Fort Supply Telephone Company has filed complaint with the Commission alleging that the Home Enterprise Telephone Company, of Woodward, is not giving the patrons of the former company adequate long-distance service under the recent order of the Corporation Commission requiring physical connection. It is claimed that one wire has been connected up under that order but that it is not enough to handle the business and the Fort Supply Company now wants a second wire. The Home Enterprise Company makes long-distance connections with the Pioneer Telephone and Telegraph Company at Woodward and with the Southwest Telephone Company at Higgins, Tex.

INDIANA.

It is probable that Indiana will soon have a law providing for the regulation of all public utilities. A conference of state officials has decided that a bill providing for such regulation will be introduced at the coming session of the Legislature and pressed for passage. The bill will provide for granting additional powers to the present Railroad Commission and no new commission will be created.

OHIO.

After three attempts, two being fruitless, the Columbus, Kenton & Toledo Company, secured permission from the Public Utilities Commission to issue enough stocks and bonds to enable it to complete the proposed line from Toledo to Columbus, passing through Findlay, Kenton, Richwood and Delaware. The company was authorized by the Commission to issue $1,385,000 bonds and $50,000 capital stock.

NEW YORK.

The Public Service Commission, First District, has issued an order granting the Kings County Lighting Company permission to issue $625,000 in bonds, maturing July 1, 1954, and redeemable January 1, 1940, at 105 and accrued interest. These bonds will bear interest at five per cent, payable semi-annually. The permission is given on the condition that the bonds shall be sold so as to net the company not less than 96 per cent of the par value, besides accrued interest, and that the proceeds shall be applied for construction, reimbursement of moneys expended for improvement of plant, acquisition or discharge of $250,000 debenture bonds of the Kings County Gas and Illuminating Company, and for expenses of sale of bonds and payment of mortgage tax. The company is ordered to maintain a sinking fund.

The Public Service Commission, Second District, has authorized the Niagara, Lockport and Ontario Power Company to issue and sell as of June 1, 1912, $2,000,000 of its first preferred capital stock at par. The proceeds are to be used solely for the purpose of paying and discharging five-per-cent, 30-year gold coupon notes of this company of a total par value of $2,000,000 which matured June 1, 1912.

The Commission has authorized the Electric Power Securities Company of Niagara Falls to acquire and hold 9,800 shares of the first preferred capital stock of the Niagara, Lockport and Ontario Power Company, being 49 per

cent of the issue authorized by the Commission. The Electric Power Securities Company of Niagara Falls is now the holder and owner of an aggregate of 15,462 shares of the second preferred stock, and Niagara, Lockport and common stock of that company, or 49 per cent of the entire stock.

The Commission has authorized the Adams Electric Light Company, Limited, to sell its electric light plant to the Adams Electric Light Company, and the Adams Electric Light Company is authorized to exercise franchises granted by the village of Adams and the town of Watertown for distribution of electricity in these places. The company is also authorized to issue common capital stock to the amount of $18,000 to be used in payment for the property of the Adams Electric Light Company, Limited. The applicant is also authorized to issue a mortgage upon all its property for $30,000 to secure an issue of six-per-cent, 20-year bonds and to issue presently $20,000 of bonds of which $12,400 shall be used for the construction of transmission lines from the city of Watertown to the village of Adams, and $7,600 for improvements and additions to its plant in the village of Adams.

The Public Service Commission, Second District, has authorized the Oxford Electric Light Company to make a mortgage upon all its property to secure an issue of five-per-cent gold coupon bonds to the amount of $50,000. The company is authorized to issue bonds to the amount of $32,500, to be sold at not less than 85.

Fatal Electric Shock.

Attempting to fight a fire in the tower of the City Hall, Atlantic City, recently, Capt. Edward Barnett, of the fire department, was instantly killed when a lantern in his hand completed a high-tension electric circuit, states a news item in *Power*. Chief George Profatt, of the City Electric Bureau, was knocked unconscious in an effort to rescue Barnett, and several firemen were hurled from the tower to a landing 15 feet below when the metal trimmings of the tower on which they were standing became grounded.

A popular novelist, in one of her latest works, states that wireless telegraphy and light rays were familiar to the Egyptian priests and to that particular sect known as the Hermetic Brethren, many of whom used "violet rays" for chemical and other purposes. Wireless telegraphy was an ordinary method of communication between them, and they had their "stations" for it in high towers on certain points of land as we have now.—*Marconigraph.*

Questions and Answers.

Questions.

No. 80.—Tumbler Switches.—I understand that "tumbler" switches are largely used in England for places where we would use push-button switches. How does this type of switch differ from our common rotary snap switches?—B. F., Aurora, Ill.

No. 82.—Insulation-Resistance Test of House Wiring.—What is the simplest and yet thoroughly reliable test of insulation resistance for the wiring in a large apartment house to determine whether it meets the strictest requirements of the National Code?—N. D. L., Oakland, Cal.

No. 83.—Quartz-Tube Mercury-Arc Lamps.—Have any of the new quartz-tube mercury-arc lamps that are coming into use in Europe been tried out for street lighting in this country? Can such lamps be purchased here?—B. V. S., Richmond, Va.

No. 84.—Rotary Converters on Electric Locomotives.—Has the use of rotary converters ever been tried on electric locomotives for supplying current to direct-current traction motors from a high-voltage single-phase trolley line? Would not the better efficiency, weight and speed control of such motors make up for the small losses of the rotaries?—M. R. E., Hartford, Conn.

Answers.

No. 79.—Electric Hair Clippers.—Are there available on the market electric hair clippers for barbers' use? Recently I saw an electrically driven horse clipper in use in a large livery stable; it seems to me a similar machine could be made for use in barber shops.—P. J. W., Buffalo, N. Y.

An electric hair clipper for use commercially in a barber shop would necessarily have to be so designed that vibration would be practically eliminated. In the horse clipper referred to the blades of the clipper are operated by an eccentric attached to the end of a flexible shaft, which in turn is driven by hand power or a machine. The vibration caused by the revolving eccentric is too great to allow the attendant to handle the clipper with accuracy and it is necessary to press the base of the clipper against the horse's body to steady the operator's hand as much as possible, and the clipping is consequently rather close.

In adapting this device to use in a barber shop, some method other than an eccentric would have to be utilized, as a barber could not handle a vibrating clipper as rapidly nor as deftly as he does the type in use at present. There is also the commercial feature to be taken into consideration. A machine-operated clipper would require the use of a motor, a flexible shaft, expensive owing to its extreme flexibility and size, and also a special clipper. As the work done by the use of the clippers is only a small fraction of the total work done by the barber, he is not warranted in incurring the added expense of these extra items, which would not make a satisfactory gain in profits.—E. C., Kansas City, Mo.

No. 85.—Synchronizing Phonograph and Moving-Picture Machine.—Has any reliable method of exactly synchronizing a phonograph with a moving-picture machine been perfected and placed in operation? If so, is it very complicated?—T. H. S., Lake Bluff, Ill.

To date there has been no synchronizing device developed which is reliable for commercial use; there have, however, been several machines, among them one designed by Thomas A. Edison, which apparently give simultaneous action of the phonograph and the motion-picture machine, but they have not as yet proved to be commercial, although it is possible that the commercial machine will be developed along the lines of one of these experimental machines. These experimental machines, in so far as has been made public, seem to be built along lines which require a supplemental governing device which will keep the phonograph and the motion-picture machine in exact synchronism during operation. The fact that there must be synchronism between the two parts places a restriction on the type of motion-picture play used, as an ordinary phonograph of today would not pick up the sounds over the distance at which the pictures are taken at times. For pictures taken at close range, where the action is continuous, the scene could be "taken" by means of a composite phonograph-motion-picture machine with a synchronizing device, but it would have to be reproduced under identical conditions as met with in the field.—E. C., Kansas City, Mo.

I have it on pretty good authority that the synchronizing phonograph and moving-picture device has been reasonably well perfected and placed in experimental operation. However, the method has not yet come into general use, as far as I am aware, for some reason or other. The difficulty of obtaining perfect synchronization is much greater than might at first appear. Even electrical methods have been found wanting in some respects, since it is essential to success to overcome even the slightest difference in speed and time.

It is well to remark that a similar problem was presented in the picture telegraph, and solved with notable success in the Korn, Baker, and other apparatus.

There is a long road from the laboratory experiments to the commercial operation, particularly when such a matter as perfect synchronization is concerned.—P. E., Minneapolis, Minn.

Annual Report of British Electrical Inspector of Factories.

The report of G. Scott Ram, British electrical inspector of factories for the year 1911, recently issued, is an interesting document and conveys a number of instructive lessons to all engaged in the design, construction, and use of electrical machinery.

TABLE I.—ACCIDENTS AT ELECTRICAL GENERATING STATIONS AND SUBSTATIONS IN 1911.

The small figures relate to fatal accidents, and are included in the principal figures.

Description.	Central Stations and Electric Railways.	Other Plants.
Non-electrical:		
At engines, pumps, and generators	18	4
At boilers and steam plant	39	4
At coal-handling plant	18[1]	3
Falls	76[5]	8[1]
Struck by falling bodies	28	—
Miscellaneous	91[1]	17
Total	270[7]	38[1]
Electrical:		
At switchboards when engaged in ordinary routine work—mostly due to faulty design of apparatus or to mistakes on the part of the switchman	12	5
Cleaning, repairing, etc., at live switchboards or other live conductors	27[3]	2
Cleaning, repairing, or other handling of switchboards supposed to have been dead	3[1]	—
Adjusting brushes and cleaning commutators	9	3
Miscellaneous	12	1
Total	63[4]	11

The number of electrical accidents was somewhat greater than in previous years—74 against 58 last year—the number of fatalities, four, being the same. With few exceptions the causes of the accidents were similar to those which have been described in former reports. Under the first heading several were due to mistakes on the part of the switchmen, in some cases showing carelessness or incompetence. The next class of accident—through working on live switchboards or other live apparatus or conductors—is often due to carelessness on the part of the responsible person in charge of the work, or of the injured person himself, frequently by omitting to observe the most elementary precautions. In working on a dead portion of a high-tension switchboard, adequate screening of adjacent live conductors is not always provided. In some cases, although ample screening has been provided in respect of persons working from the floor level, it has been overlooked that the work might necessitate the person getting on to a higher level for some purpose, and so being close to live conductors. In one of these cases the man received a shock and severe burns from a 6,000-volt system. He was rendered insensible, but was resuscitated by artificial respiration, and was able to return to light work in about six weeks. In another similar case, the man was killed outright on a 20,000-volt system. Screens were actually provided in this case and were lying on the floor unused. The actual work in hand was upon some apparatus about 2 or 3 feet from the floor. There were live conductors above, about 8 feet 6 inches from the floor. It was overlooked that in reinstating the apparatus a man might climb on to a part of it and so be within reach of the live conductors.

Several accidents occurred in cleaning extra-high tension switchboards. In one case, in a substation, a cell had been made dead and the door opened for cleaning. A second door was then opened before the conductors had been made dead. The cleaner went into the second chamber and received a shock between his hand and neck. A heavy short-circuit occurred, bringing out the circuit-breaker at the generating station. The man was badly burned and was rendered insensible, but was brought to by artificial respiration and was able to return to work in a few weeks. In another case, in a generating station the switchboard was arranged in two sections, so that either could at any time be made dead for cleaning or other work, but was not otherwise subdivided. There was an interconnecting switch at the end of one section, but not screened off. This switch could have been made dead by means of isolating switches in the gallery below, but this had not been done, and it was, therefore, live on one side. The man who was cleaning, who was also a switchboard attendant, touched this switch, and although severely injured by shock and burns, his right arm having to be amputated at the shoulder, he escaped with his life. In subsequent legal proceedings, the responsibility for the accident was held to lie with the injured man himself for going into the chamber while the interconnecting switch was live. In another case, a man was cleaning insulators with exposed conductors at extra high tension close by. He was severely injured, but not killed. In another, a substation attendant received a shock at extra high pressure, apparently through his own fault in not making sure whether the current had been switched off at the generating-station end of the line before starting to clean the apparatus. Another high-tension accident occurred to a man working in a switchboard cell, and appears to have been due to the stupidity of the man in charge in allowing the pressure to be turned on before the work was completed. In another case, a "competent" man was fixing a guard at some high-tension apparatus with wire. As might have been expected the loose end made contact with a live conductor. In the second fatal case a competent and experienced man appears to have forgotten that the oil switch which he was examining was live, and touched one of the terminals. It is remarkable that of the above nine accidents on high-tension or extra-high-tension alternating systems, only two had fatal results.

Several accidents occurred through men making short-circuits on direct-current medium-pressure systems. Some were due to the omission to take any kind of precautionary measures. Thus, ordinary engine-room wrenches were used in several cases to tighten up nuts at the backs of switchboards, no precautions by screening or otherwise being taken, the wrench being applied to a live nut on one pole, bare busbars or other conductors on the other pole being only a short distance away—less than the length of the wrench. The extraordinary thing is that such things are done by switchboard attendants of experience. Much of the blame often, however, lies with the employers or their responsible engineer in not providing special insulated wrenches or other forms of temporary protection in view of work on live conductors becoming necessary. In one case, two assistant engineers proceeded on the above lines to tighten up a live nut on one of the main connections behind the busbars at the back of the switchboard and produced the inevitable short-circuit. They were both burned, but not very badly. The short-circuit apparently produced a surge with probably a big rise in the pressure on the breaking of the short-circuit current, with the result that a flash-over occurred at another part of the switchboard several feet away, at a place where the positive and negative conductors on a marble panel were barely one inch apart, without any insulating division between. The normal difference of pressure between these conductors was 580 volts, and although this would be a long way below that necessary to start an arc between conductors in air, it might conceivably do so without difficulty if dirt or dust were allowed to accumulate on the surface of the marble. There is no doubt, however, that on the breaking of a very heavy current such as would be caused by a short-circuit on a station switchboard with 2,000 or 3,000 kilowatts behind it and with no circuit-breakers on the generators, a very great momentary rise in pressure might occur. On 550-volt traction switchboards it has been proved that the operation of a feeder circuit-breaker on heavy overload may produce a momentary rise of pressure of over 10,000 volts. The design of the switchboard, with the main conductors placed so closely together, was obviously at fault, as even under normal conditions accidental short-circuit might be readily brought about, and the mere cleaning of the surface of the marble between the conductors would be a hazardous undertaking. The above accident had a very unfortunate sequel a few hours later. The switchboard attendant noticed that at the place where the arcing-over had occurred, there was a slight discharge going on across the marble be-

tween the positive and negative conductors. This may have occurred through a film of copper having been deposited on the marble at the time of the flash-over. He reported the sparking to the station superintendent, and while the latter was looking at it, it again developed into a flash-over or short-circuit, with the result that the superintendent was so severely burned that he died within a few hours.

Under the next heading, the fatal accident occurred to an experienced man who was about to do some work in a cell of a single-phase high-tension switchboard. The system had one pole earthed, and the switchboard was a single-pole one. The cell contained an oil switch for a generator. The switch was connected directly, and not through isolating switches, to the ring busbars of the switchboard. The busbars were, however, provided with a number of disconnecting links in order that any circuit might be isolated by removing the link on each side of the point where it connected with the busbars. The man had removed the links on each side of the connection to the switch at which he was intending to work. Unfortunately the system of disconnecting links had not been adhered to when extensions had been made. A generator placed at a later date in another engine-room had been connected to the same part of the busbars. The removal of the two disconnecting links did not therefore disconnect the second generator from the switch cell in question. This second generator happened to be at work, and although it was connected to the busbars through an oil switch, the man appeared to have forgotten the arrangement of the connections and omitted to pull out the switch. He consequently opened the door of the switch cell of the first generator, thinking it was all dead, and received a fatal-shock. It is important where the connections are not visible that a diagram of the connections should be hung up in the switch-room for ready reference before any work is undertaken. A useful precaution adopted in many stations is also recommended, namely, that a second competent person should check the position of the switches and isolating links before any work is commenced.

TABLE II.—ELECTRICAL ACCIDENTS IN FACTORIES OTHER THAN ELECTRICAL STATIONS IN 1911.

Arcing of switches	37
Arcing of fuses	10
Shock of burns from fuses when replacing fuse wires	28
Portable apparatus, connectors, and flexible wires	62[5]
Unprotected conductors, swtiches, terminals, fuses, etc	23
Working on or near live conductors—skilled persons	41
Working on or near live conductors—unskilled persons	24
Miscellaneous accidents in electrical manufacturing works—mostly in testing operations	36[1]
Adjusting brushes and cleaning commutators	2
Miscellaneous	27[4]
Total	290[7]

These accidents show a slight increase in number over those of the previous year—290, as against 276—whilst the fatalities were 7, as compared with 5 in the previous year.

Of those caused by the arcing of switches, a number on motor circuits were as usual primarily due to the previous failure of the no-voltage release on the starting switch, so that the main motor switch was put in on a short-circuit, producing a heavy arc at the contacts. In some cases the switches were protected by covers having a slot for the handle to work through. This form of cover is the only one which can be applied to certain types of switch, and while it is satisfactory in preventing the operator from touching live metal, it does not protect the hand from being burned if a heavy arc occurs within the cover, unless there is in addition a shield on the handle. Accidents from the arcing of fuses are due to absence of adequate protection. Some inclosed or cartridge-type fuses which will operate satisfactorily on a moderate overload will explode violently on a short-circuit, and need protection as much as bare fuse wires.

Many of the accidents in the renewing of fuses were with the primitive type of bare wire or strip-metal fuses directly connected to the live fuse terminals, and unprotected by a switch. Short-circuits were made with screw-drivers or by the fuse metal getting across both poles. In some cases, switches were provided for cutting off the pressure, but were not used. In one case the man took hold of a live fuse terminal, 220 volts alternating, and was unable to let go until pulled away by some one else.

The 62 accidents in connection with portable apparatus were mostly due to short-circuits, causing burns. In 24 cases the short-circuits were in the flexible wires, and were due to the covering of the wires having been damaged, or to the fact that the wires were insufficiently protected in the first instance in view of the rough treatment to which they would be subjected in ordinary use. In 21 cases the short-circuit occurred at the connector plug, and under circumstances where the accidents would have been prevented by the use of plugs constructed with hand shields. There were several cases of shock received from portable drills which were leaky, and had not been earthed. The two fatalities occurred through the use of unearthed and improperly constructed hand lamps. In the first case an ordinary switch lampholder was connected by means of flexible wires and an adapter to the lighting system. The pressure was 250 volts direct, from a public supply, and the lampholder was not earthed. The lampholder was through some defect live, and the man holding it was in connection with earth. He was washing out a metal vat with a hose pipe, and was standing on wet steps. He called out three times, and a boy ran to his assistance, and received a shock in trying to pull the lampholder away. Unfortunately in this case artificial respiration was not attempted. In the other fatal case the victim was grasping a hand lamp of old pattern, having the lampholder in connection with the other metal work, which was not earthed. The current was alternating, 220 volts.

The accidents to skilled men when working on live conductors are frequently inexcusable, the men taking unnecessary risks of which they are fully aware. In some cases they have not taken the trouble to switch off the pressure, and in other cases the work might have waited until after factory hours, when the whole installation, or at any rate the particular circuit, could have been made dead without inconvenience. The similar accidents to unskilled men were in several cases due to the stupidity of, or want of proper supervision on the part of, the electrician in charge of the work. In some cases the men attempted to do some work entirely on their own responsibility, and in others they were employed on work for which they were not technically competent.

The accidents occurring at the works of electrical manufacturing firms were nearly all in the testing departments. The average age of 32 of the 36 persons meeting with accidents was only 21 years. Employment in the testing departments of such works is given largely to young men from technical colleges, who desire it in order to gain experience. Several received shocks at high pressure. The fatal case occurred in a large testing shop, and was due to a mistake in connecting up two high-pressure machines with the same set of conductors and artificial load, one set of men apparently not being aware of what the others were doing. One machine was started up, and a man working on the other received a fatal shock.

Under the heading "miscellaneous" there were four fatalities. One occurred at a shed of an electrically operated railway, the man climbing on to the roof of a car, apparently forgetting that the high-tension overhead wires were live. The second occurred in a shipyard to a man working a large outdoor radial drilling machine, which was driven by a three-phase 440-volt motor bolted to it. The machine was fixed to an upright baulk of timber, and was not earthed. A leakage occurred at the motor, and the whole machine, together with the metal plate being drilled, and which rested on timber, became charged. The man operating the machine was killed, and his helper, who went to his assistance, received a severe shock. The third fatality occurred to the driver of an overhead electric traveling crane in an engineering shop. He was attempting to get from one crane to another in the adjoining bay by climbing across a girder, above which the trolley

wires were placed, and with which he appears to have come into contact. He was taking a short cut, instead of going down one ladder and up another. The fourth fatality occurred at the trolley wires of a dock crane which were on the ground and unprotected, except for a longitudinal slot in the cover, through which the collectors traveled. The man appears to have dropped something in the slot and to have put his hand in to try and get it out, and touched the conductors.

Examples of new work were found which were not in compliance with the requirements. The electrical contractors are often responsible for this, either in not taking the trouble to consider the regulations or, as is evident in some cases, for the sake of cheapness.

Dangerous fuses continue to be found even in new work. This is probably partly due to stocks of undesirable patterns being still in the hands of dealers, although, judging by advertisements which appear in the trade papers, it would seem that they are still being manufactured. One manufacturer who has now introduced a satisfactory line of new patterns informs me that he still makes the old ones, as they are in considerable demand for export, and he, of course, has no control as to their ultimate use in this country on factory premises. A common fault in fuses is that they cannot be handled for purposes of renewal without danger of shock through touching live metal. Thus grip-type fuses having a porcelain grip only about three inches in length, with exposed live-metal end contacts are in use on 500-volt and 440-volt alternating-current systems unprotected by switches, and in earthed metal cabinets, and some over metal floors, and others out of doors over wet ground. It is impossible to handle such fuses without risk of dangerous shock. Similar fuses of the cartridge type are also often found under like dangerous conditions. Another common type of fuse carrier for small fuses has the fuse wire lying in a groove on the front of the porcelain bridge, so that apart from the risk of shock there is danger to the person renewing the fuse wire, when replacing the carrier on the fuse board, of getting his hand burned should the fuse blow, as it often does, just at that moment by reason of the fault on the circuit which caused it to go in the first instance not having been rectified. In cases where fuses are protected by switches, they are sometimes placed in a dangerous position. Thus, open-ended tubular-type fuses, often for large currents, are placed on switchboards immediately above or below the switch without any intervening guard, so that if they should blow at the moment of switching on, the switchman is liable to get his hand severely burned. There were a number of instances of such an arrangement with fuses up to 1,500 amperes capacity. Such fuses for circuits of large current are liable to be dangerous in any event and ought not to be used unless specially guarded. Reliable circuit-breakers are now obtainable at prices which will allow of their adoption on circuits of comparatively small current and are often to be preferred to fuses.

Manufacturers of electric irons do not yet appear to have realized that these articles when used on factory premises are liable to be used under conditions which necessitate their being earthed, no provision being made for the attachment of an earth wire. In one laundry ten irons were in use on a 200-volt alternating supply. The floor was of brick, non-insulating, and the girls complained that they received shocks from the irons and had to be very careful to handle them with a cloth, so as not to touch the metal parts. The flexible wires, which were all twisted up and the insulation damaged, were connected by means of adapters to lamp sockets and there was no switch in the room, the only switch being the main supply switch in an adjoining passage and placed quite out of reach. The conditions were such as might readily lead to a fatal accident.

In many works, particularly engineering works and shipyards, the importance of adequately earthing frames and covers of electrical apparatus is not always appreciated. A fatal accident was due to this neglect.

In important electricity supply and traction undertakings there is often neglect of elementary precautions, and the presumably competent persons employed do not always appear to realize the risks they often unnecessarily take. Thus, in a railway substation an attendant was found eating his supper while sitting on the bedplate of a motor generator, with a bare terminal block at 600 volts above earth only two or three inches behind his head.

There are still to be found in use numerous examples of switches of a dangerous type, in which the handle cannot be grasped without danger of touching live metal. On a public-supply-station switchboard double-pole switches were found with live nuts on the handle side of the cross-bar less than three inches apart, with the switch handle between, there being 500 volts difference of pressure between the nuts.

In the case of important new stations, the engineers responsible for the design do not always give sufficient attention to the practical side of the subsequent running of the station. Two examples of such want of foresight came to notice during the year. One was a high-pressure three-phase station for the supply of electrical energy over an extensive area through substations. Here the switchboard was badly designed. All the necessary isolating switches were there, but were wrongly connected and arranged. The oil switches for both generators and feeders were connected directly to the busbars, the isolating switches being between the oil switches and the generators and feeders. By this means, although it was possible to isolate any generator or feeder, it was impossible to isolate any of the oil switches. Should an oil switch require overhauling, and in every well managed station such oil switches would be examined and overhauled periodically whether they had given any trouble or not, the work could only be undertaken by shutting down the whole supply. In this case a firm of consulting engineers was responsible for the arrangement.

Petroleum Breaks Record.

Petroleum production in the United States in 1911 surpassed its own record made in 1910 by an increase of nearly 11,000,000 barrels. In 1910 the output was 209,557,248 barrels. The total production of the world also surpassed all previous records, amounting to over 345,000,000 barrels, and of this the United States produced more than 63 per cent. The value of this enormous output of oil in the United States for 1911 was $134,044,752, the average price being 60.8 cents a barrel.

Pateros Plant.

The Nixon-Kimmel Co., of Spokane, Wash., is making rapid progress on its hydroelectric plant at Pateros, Wash.

The ultimate capacity of the plant is to be 2,300 horsepower, to be used largely for irrigation purposes. There will be eight miles of transmission line to Brewster, and 23 miles to Bridgeport. Power will be transmitted at 23,000 volts.

Nevada Copper Production.

Copper production increased in Nevada from 64,359,398 pounds, valued at $8,173,643, in 1910, to 67,377,518 pounds, valued at $8,422,190, in 1911. The increase was practically due to the mines at Ely in the Robinson district, White Pine County, which yielded 67,033,547 pounds, or 99.49 per cent of the entire state production.

THE CONSTRUCTION AND EQUIPMENT OF A MODERN SUBSTATION FOR THE DISTRIBUTION OF ELECTRICAL ENERGY.—II.

By Alden W. Welch.

Mercury-Arc Rectifier Equipment.

It was mentioned in the early part of this article that the station would be called upon to take care of 120 city arc lamps. These arcs are more or less distributed and we will consider the problem of handling them in a modern and practical manner. Fig. 2 gives an idea of the number, distribution and manner of connection of the arc lamps. The figure shows two circuits of 70 and 50 arcs respectively. Circuit *A* is two miles in length and at 70 volts per lamp will operate at a pressure of 3,500 volts. Circuit *B* is 1.5 miles long and will have a pressure of 4,900 volts.

There are two accepted methods for supplying city arc lamps with direct current. The older way is by use of arc machines. The best known of these is the Brush arc dynamo. This machine develops a pulsating current of practically constant value. The advance of the profession has gradually pushed this type of apparatus out of date, although it is still largely used. It is of low efficiency, requires a great deal of attention and is, in addition, dangercus to the operator. An injury received from the operation of these machines is not an exception in the life of an operator.

The other and more recent method is one that was tried timidly at first but is now considered to be the best practice. It is by the use of mercury-arc rectifiers.

The high-tension ammeters for indicating the continuous current should have a heavy black line marked on the scale at the 6.6-ampere point so that this point will be the most noticeable on the scale. There is an oil switch for throwing the rectifier on the three-phase bus and a double-pole, single-throw switch for connecting the rectifier to the arc switchboard.

The tubes cost from $20 to $30 each and last from 0 to 3,000 hours and even longer in certain freak cases. Sometimes they burn out, due to poor vacuum, the first time the switch is closed. All tubes should be guaranteed for at least 500 hours.

The tube or bulb is a vital part of a mercury-arc rectifier set and its development has not yet reached perfection. It is well to be familiar with the characteristics of these tubes. A consideration of the Westinghouse type will be sufficient. Between the limits of 25 and 45 degrees centigrade, changes in temperature have little effect on their operation or life. A decrease in temperature decreases the mercury vapor pressure and below 25 degrees has a tendency to make starting difficult and to cause the arc to go out after it is formed. A temperature greater than 45 degrees overheats the bulb and makes a short-circuit liable. At 50 degrees and above there is danger from electrolysis of the glass. The temperature which will produce this latter condition depends upon the quality of the glass used in the manufacture of the bulbs. This glass is usually of the lead quality used in all blown-glass work. The temperature values given are those of the thermometer on the tank. The temperature of the bulb is about 10 degrees higher.

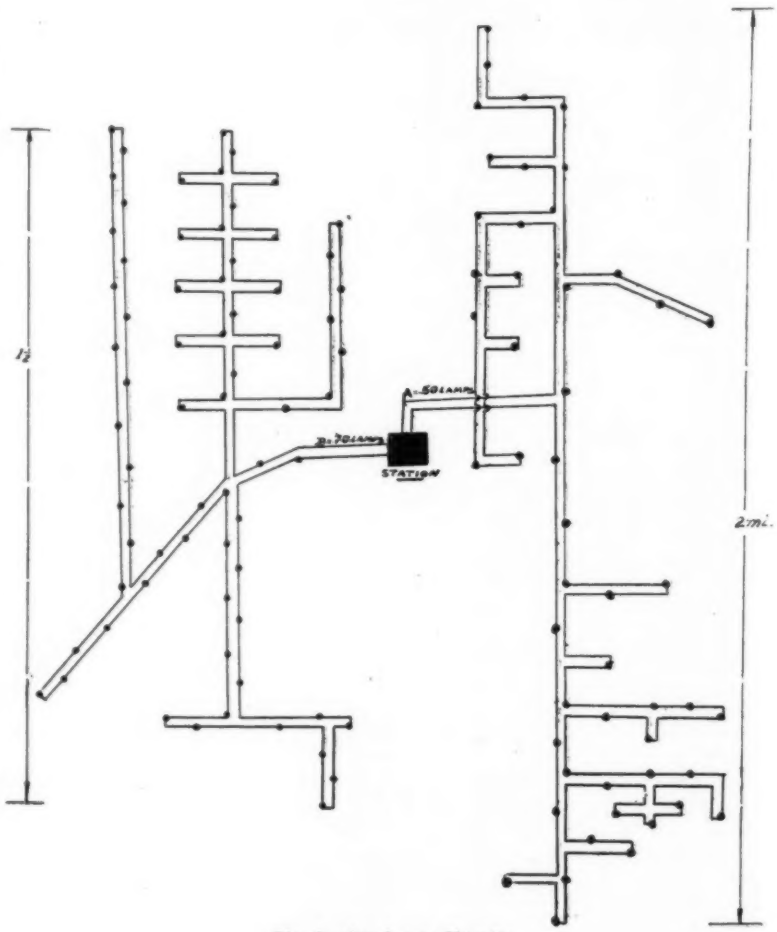


Fig. 2.—Arc-Lamp Circuits.

It is very possible that during shipment the mercury in the tube will spatter and get upon the graphite electrodes, which are porous. This would cause a short-circuit at higher voltage. By operating the tube on short-circuit the electrodes are dried out and this danger averted. Every evening before picking up the arc circuits, the bulbs are run on short-circuit for the purpose of warming them up so they will not drop out.

It is extremely important that there be a good vacuum within the bulb and this may easily be determined by holding the tube by its cathode legs in an upright position as it runs in its box and tapping it gently on the top. If the vacuum is good the mercury will give a metallic click as if there were a solid inside. If bad it will give a swish as though there were water within.

The constant-current transformer may be either air or oil-and-water-cooled. The advantages of the former method are the ease with which the coil may be inspected and the absence from the building of large quantities of oil. This latter point is of importance as certain cases have occured where the insurance on the building was increased due to the presence of the oil. But if oil is used for cooling, this situation can be taken care of by the installation of a drainage system whereby in time of danger the oil may either be run into the sewer or into a sunken cistern either outside or beneath the building. The latter scheme is original and I think is a good one. The General Elec-

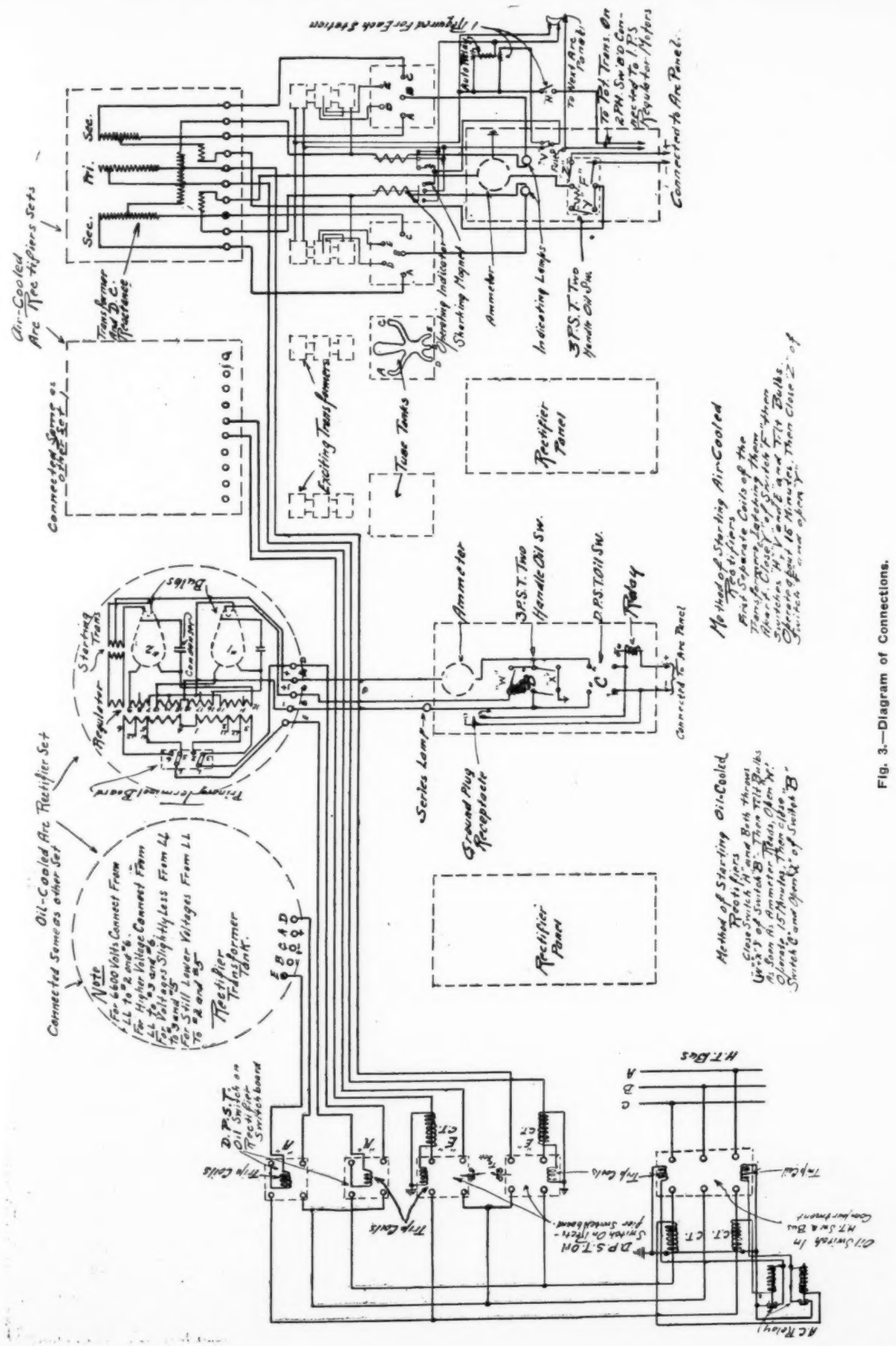


Fig. 3.—Diagram of Connections.

tric rectifier requires oil only in the tube tank so that when this type is installed, this problem need not be considered. The Westinghouse sets, however, are oil-cooled and require approximately 800 gallons each. Transil oil costs about 23 cents per gallon, or $184 per set. To run this oil into the sewer would constitute a total loss while to run it into a reservoir would mean that when it was again needed it could be obtained. If the sewer method is adopted, the cooling water should be run into the sewer simultaneously with the oil through the same pipe but with the reservoir method the water should be fed through a separate pipe to the sewer. One argument in favor of the latter method is that it prevents a possible explosion in the sewer or in the discharge pipe. The flash point of the oil is about 220 degrees centigrade. In the event of a fire the oil might be heated nearly to this figure and when brought in contact with the water would have a tendency to generate steam which would be dangerous. When there is no available space outside the station, the reservoir can be constructed under the main floor or the basement floor as the case may be.

The iron tank in which the General Electric tubes operate is kept at the proper temperature by means of water circulating through a cooling coil. The quantity of water at 70 degrees Fahrenheit required for cooling is as follows:

With air at 100 degrees Fahrenheit.....3.5 gallons per hour
With air at 90 degrees Fahrenheit.....2.5 gallons per hour
With air at 70 degrees Fahrenheit.....1.0 gallons per hour
With air below 70 degrees Fahrenheit...0.0 gallons per hour

Thermometer and incoming needle valve are supplied with the tank; external piping, however, is extra unless specially ordered. No water cooling is necessary for the 12-light size.

The function of the static discharger is to protect the tube, etc., from undue electrical strain at starting. This effect is more marked with old tubes.

The rectifier tube, in which the transformation from alternating current to continuous current is accomplished, is an exhausted glass bulb containing one positive terminal in each of the two upper arms, two mercury starting anodes and the mercury negative terminal at the bottom. The tube is immersed in oil and supported in a wooden carrier. It is started by shaking it slightly, which causes a bridge of mercury to be formed and broken between the starting terminals. A small arc is thus produced. The main arc can now be established by closing the primary switch of the constant-current transformer, connecting the secondary of the transformer in circuit with the operating anodes of the tube.

The complete charges against the purchase working order for the two rectifiers would be about as follows:

Two 6.6-ampere, 6,600-volt, 25-cycle, 85-lamp mercury-arc rectifier sets at $3,000 each	$6,000.00
Two extra tubes	50.00
Two drip pans	4.00
Insurance on outfits at 0.25 per cent	15.00
Making water connection to sewer	35.00
One Weston voltmeter, model No. 11	95.00
Freight, express and cartage	85.00
Inspection trip to factory	21.00
Total charges	$6,305.00

The efficiency of the rectifier set at full load is about 90 per cent. The power-factor is about 70 per cent with this load condition. The mercury-arc rectifier has proven itself to be a success and is firmly established for this sort of work. Fig. 3 is a diagram showing the connection and interconnection of four sets, two of each type.

The Two-Phase Distribution System.

Much has been written concerning the several advantages of the three-phase system over the two-phase, and *vice versa*. Three-phase, four-wire has the advantage of flexibility but the use of the fourth wire annuls the reduction of copper which has been one of its recommendations. Additional apparatus is required on the distribution system, such as three transformers where two are sufficient for two-phase. An extra regulation is also necessary for the three-phase system. The regulation for the two methods is about equal. But on the whole, I have decided to design this substation to distribute two-phase current. This is a standard method and in very general use.

Two-phase Machines.

The machines for furnishing the 2,400-volt, two-phase current are two 1,000-kilowatt synchronous frequency-changer sets, each rated as follows:

Generator: 1,250 kilovolt-amperes or 1,000 kilowatt; 2,700/5,400 volts; 232/116 amperes per phase; 375 revolutions per minute; 20 poles; two-phase; 62.5 cycles per second.

The efficiency ranges from 85 per cent at one-half load to 90 per cent at full load.

Motor: 1,060 kilowatts; 6,600 volts; 97.5 amperes per phase; three-phase; 25 cycles per second; 8 poles.

The cost of each set is approximately $15,000. This amount will be further increased by $200 for freight and cartage, $37.50 for insurance and $50.00 for inspection, making a total of $15,287.50 per set or $30,575 for both.

The weights of the different parts of such a machine are: rotor and shaft, 35,500 pounds; stator, 29,000 pounds; base, etc., 15,000 pounds; total, 79,500 pounds.

Hence the heaviest part that must be handled is the 35,500-pound combined rotor and shaft. This can be handled without a crane but in most cases the station is equipped with this facility. A 15-ton hand-operated crane of the dimensions necessary for our station would cost about $1,000. I have, however, omitted a crane in the present station.

Two-Phase and Three-Phase Switchboards and Ducts.

The two-phase switchboard will have accommodations for nine two-phase feeders, although at first but six will be installed. Two three-phase, 6,600-volt feeders will be connected to the high-tension board and space for a third reserved. These cables being of 250,000 circular mils, each will give a high-tension current capacity of 500 amperes. This, of course, will at present be more than necessary, but the extra feeder gives greater assurance of continuity of service, which is of the greatest importance.

The two switchboards with duct runs complete cost about $10,000 for material, $100 for freight and cartage, $25 for insurance, $250 for labor and $150 for inspection, making a total of $10,525.

Twelve regulators will be required for the regulation of the six two-phase feeders. These will be automatic and will cost $700 each or $8,400 for the twelve. To this must be added $110 for freight and cartage, $21 for insurance and $69 for inspection, making a total cost of $8,600.

The total cost of the three-phase and two-phase switchboards and two-phase regulators may be summed up as follows:

Switchboards erected complete with all switches, instruments, etc., with freight, cartage and insurance	$10,525
Eight automatic two phase regulators	8,600
Total, switchboards and regulators	$19,125

Tabulation of Detail Costs.

Building Construction	16,050
Mercury-arc rectifier equipment, consisting of two 85-lamp sets	6,305
Two 1,000-kilowatt synchronous frequency-changer sets	30,575
Three-phase switchboard and two-phase switchboard and eight automatic two-phase regulators	19,125
Total cost of substation (exclusive of drawings)	$72,055

Engineering Costs.

Where a central station possesses an engineering department which handles the details of a job of the dimensions considered in this article, it is well to know how much the engineering will cost. From this figure we can calculate the relation between the engineering and the construction and material costs. This percentage is a criterion of the efficiency of such a department. It is now my intention to discuss the design, inspection and supervision costs of this job.

Electrical Drawing Working Orders.

		Cost.
(1)	Drawings showing plans and section of station with duct runs in main floor and gallery	$ 200
(2)	Drawings showing assembly and details of two-phase 2,400-volt switchboard for two generators and nine feeders	250
(3)	Drawings for complete three-phase 6,600-volt switchboard	300
(4)	Drawings showing connections for two-phase and three-phase switchboards	60
(5)	Drawings showing assembly and details for the lighting of the station	20
(6)	Drawings for installation of two mercury-arc rectifiers	150
(7)	Drawings for the installation of potential transformers for the 6,600-volt switchboard	35
(8)	Drawings for installation of two frequency changers	100
(9)	Drawings for installation of oil drain pipes for Westinghouse rectifier and for the installation of oil switch, etc., for both rectifiers	35
(10)	Allowance for miscellaneous drawings and engineering for the electrical equipment of the substation	100
	Total electrical drawing cost	$ 1,250

Mechanical Drawing Working Orders.

		Cost.
(1)	Survey of property	$ 20
(2)	Test borings to determine quality of soil	40
(3)	Preliminary sketches for proposed substation	100
(4)	Drawings and specifications for substation	330
(5)	Allowance for miscellaneous drawings and engineering for the construction of the substation	50
	Total mechanical drawing cost	$ 540

Inspection Costs.

(1)	Inspection of excavation, piling and concrete foundations for building and installation of all ducts below the main floor	$ 115
(2)	Inspection of erection of the building	200
	Total cost for the inspection of construction	$ 315
(3)	Inspection of mercury-arc rectifiers before installation	21
(4)	Inspection of switchboard apparatus	150
(5)	Inspection of 12 regulators	69
(6)	Inspection of two frequency changers	100
(7)	Miscellaneous electrical inspection	30
	Total cost of electrical inspection	$ 370

Supervision Cost.

This will embrace the time of the engineer and must, of course, be estimated $ 125

Total Engineering Costs.

(1)	Supervision	$ 125
(2)	Inspection, Mechanical	315
	Inspection, Electrical	370
(3)	Mechanical drawings	540
(4)	Electrical drawings	1,250
	Total engineering costs	$ 2,600

Relation Between Engineering Costs and Construction and Material Costs.

(1)	Inspection of excavation, foundation, etc.	$ 115
	Construction of above	$ 4,600
	Inspection as percentage of construction	2.5
(2)	Inspection of erection of building	$ 200
	Erection of building plus plumbing	$10,600
	Inspection as percentage of erection	1.89
(3)	Mechanical inspection as percentage of total inspected construction work	2.13
(4)	Total electrical inspection	$ 370
	Total electrical construction, installation and apparatus cost	$55,635
	Total electrical construction as percentage of above	$ 0.67
(5)	Mechanical drawings	$ 540
	Construction	$16,050
	Cost of mechanical drawings as percentage of construction cost	3.36
(6)	Electrical drawings	$ 1,250
	Electrical construction, installation and apparatus	$55,635
	Cost of electrical drawings as percentage of electrical construction and apparatus cost	2.25
(7)	Total drawing cost	$ 1,790
	Total cost of completed station	$72,030
	Total drawing cost as percentage	2.49
(8)	Supervision	$ 125
	Completed station	$72,030
	Supervision as percentage of completed station	0.17
(9)	Total engineering cost	$ 2,600
	Completed station	$72,030
	Total engineering cost as percentage of cost of completed station	3.61

These percentages show that the engineering department has been doing efficient work on this job. The charge by an outside firm would have been about 5 per cent. In addition to the tangible saving in money there is the satisfaction of following up the work oneself. This puts the company in a position where it is familiar with the actual costs of the various items of construction, equipment, drawings and inspection. A local familiarity with such costs will offer many opportunities for saving money.

The cost of the land upon which the substation is to be erected I have not considered, as it is such a variable. To have taken this into account would have destroyed the generality of the problem.

Present Capacity.

The substation is now in a position to do business. We have carried it through from the vacant lot to the completely equipped station. It is worth while to discuss just what it is capable of doing at the present time. The two 1,000-kilowatt frequency changers are capable of delivering about 200 amperes per phase at 2,500 volts. This load represents four well loaded two-phase feeders for each machine or eight for both. This load in 20-candlepower lamps operating at 120 volts would be about 20,000. We have connected at present on the two-phase switchboard six feeders.

The mercury-arc rectifiers each have a capacity for handling 85 70-volt arc lamps, each requiring 6.6 amperes.

The maximum kilowatt demand of the rectifier equipment is 70 kilowatts.

The two three-phase feeders can carry a maximum of 2,000 kilowatts each, making a total of 4,000 kilowatts. The maximum demand upon them, allowing 85 per cent for the machines, would not exceed 2,400 kilowatts. The three-phase capacity is therefore ample, being 167 per cent of this maximum requirement.

Future Capacity.

There is space in the substation for three additional 1,000-kilowatt frequency changers. This would mean a possible two-phase load of 5,000 kilowatts. Probably six more rectifier equipments could be installed, making a possible arc load of 280 kilowatts. The total future load could therefore be at least 6,100 kilowatts. There is space on the present two-phase switchboard for one additional frequency changer and three feeders. If a very large addition to the present capacity should eventually become necessary, the gallery would probably have to be utilized for some of the two-phase switchboard extension. There is ample space here for the additional regulators.

The three-phase switchboard has present space for three frequency changers and three three-phase feeders. An increased load sufficient to crowd this station would not be imminent for many years, and should such a situation ever arise a new station would probably be necessary.

A comparatively short article dealing with such a voluminous subject as the construction and equipment of a substation must of necessity pass over many details. The multiplicity of considerations involved in a work of this character could be completely handled only in a book. I have, however, tried to explain the vital points, those desirable for central-station men to know.

Danger from High-Tension Wires.

In a paper comparing various systems of long-distance power transmission, Herr Albrecht, before the Baltic Gas, Electricity and Water Association, enumerated the various subsidiary features that cannot be entirely ignored. Overhead electric wires are responsible, according to information collected by the Saxon Bird Preservation Society, for the following loss of bird life, in a distance of three-quarters of a mile of such wire: 16 hawks, 3 buzzards, 3 owls, 2 starlings, and 6 others; whilst in another instance 8 hawks, 4 barn owls, 2 marsh owls, 2 buzzards, many jackdaws and a great number of starlings were electrocuted. So much is this the case that birds of prey know the line as a hunting ground, and themselves suffer the common penalty; and it is feared that many species will be quickly exterminated by high-tension wires. The danger to human life continually manifests itself, and the latest phase is that to passengers in airships, especially while descending to earth. The rope drags across the wires and a spark therefrom sets the gas off and brings down the balloon in flames; and this is given as the explanation of the disaster which happened to the military airship of Strassburg. Aeronauts view this source of trouble with apprehension, and in the opinion of Dr. Flemming, expressed in the year-book of the German Airship Association, the remedy can only be found by laying the electric mains underground.

The production of coal in Kansas in 1911 was 6,254,228 short tons, valued at $9,645,572.

New Electrical and Mechanical Appliances

The Hoadley-Knight Electric Hydraulic Coal-Mining System.

No industry is more prolific of disaster both distressful and costly than coal mining and no other industry of this country, owing to the crude methods employed, imposes such hardships as this upon the workmen immediately engaged in taking coal from the vein.

To alleviate these distressful conditions and to render the mining of coal a safer and more humane business than it is at present, J. H. Hoadley and W. H. Knight, mechanical, electrical and mining engineers, have developed a system of mining coal by machinery, which after several years of development has now reached a state where it is considered practicable.

Primarily designed to cut the whole seam of coal into a granular state suitable for coking, this coal-milling machine has proved itself so economical in operation that it threatens to change the whole art not only of mining coal but of transporting and consuming it, for it is believed that granular or powdered coal with the aid of water can be pumped through pipes at far less cost than it can be transported by rail, and it is also certain that powdered coal when blown into a furnace with a properly regulated air blast burns with much more economy than does lump coal when burned on the grate.

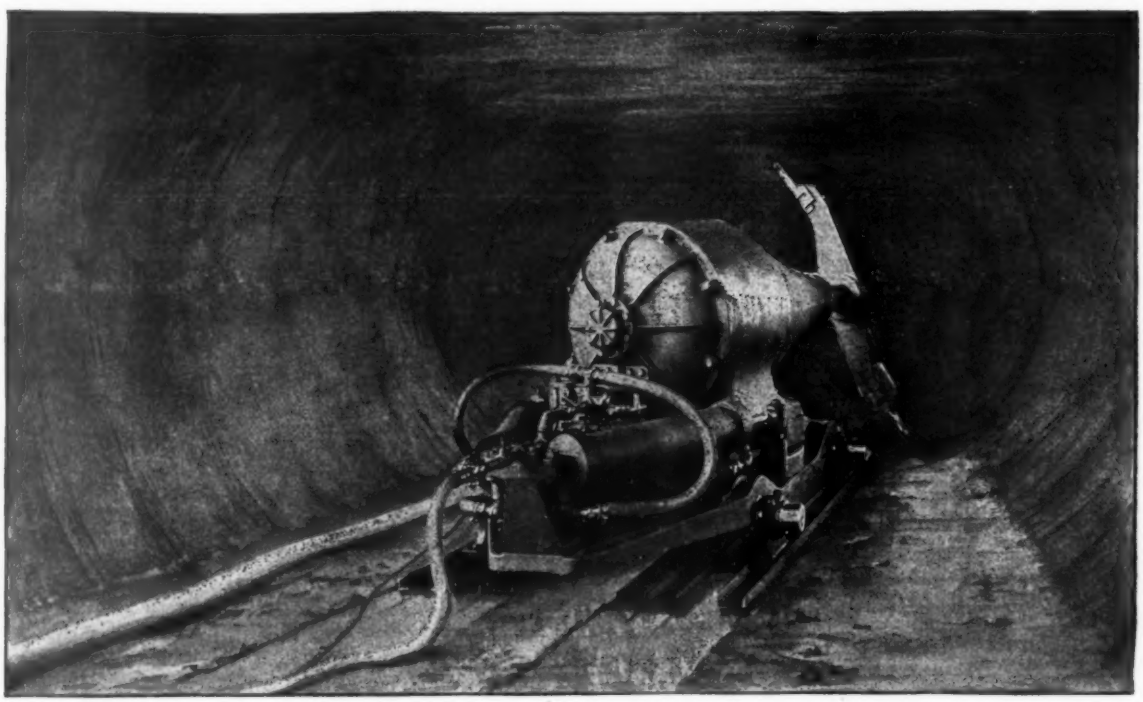
There are, however, 100,000,000 tons of coal coked each year in this country and it is with especial reference to this kind of coal that the inventors have directed their attention.

The Hoadley-Knight coal-milling machine not only cuts the coal from floor to roof into a finely powdered state but pumps it, mixed with water of the mine, to any distance desired, as, for instance, to the coal washer or the coal bins adjacent to the coke ovens. It necessarily does away with the use of explosives, and as the mine is always wet and washed clean there is never any coal dust. The system is a peculiarly safe one to use in gaseous mines on this account.

The machine itself is automatic, advancing by a simple hydraulic-ram feed mechanism which propels it along the floor into the face of the seam, the rotary cutters on the rotor shaft of the induction motor cutting the coal very much as a circular saw cuts wood. The illustration shows the machine cutting a room. The height of the cut is determined by the diameter of the cutting tools, which would of course be different for different heights of seams.

In addition to its forward movement, the motor is given an adjustable sidewise swinging motion which determines the width of the cut or room. If the machine advances straight ahead without any lateral swing, it cuts a circular tunnel. As the lateral swing is made to increase by moving the reversing stops further apart, the opening widens, the top and bottom becoming flat and the side walls more and more elliptically vertical until when the machine swings 180 degrees the room becomes a rectangle. The most advantageous side swing is about 90 degrees.

The motor is a three-phase induc-



Hoadley-Knight Coal-Milling Machine.

tion motor and in the machine shown is rated at 60 horsepower and 600 revolutions per minute. Its rotor runs on ball bearings and requires no lubrication or attention. The motor is entirely waterproof and is of exceptionally rugged construction so as to withstand rock falls or other severe conditions of the service. The machine is entirely automatic and requires the presence of an attendant merely to see that everything is operating correctly. He can tell from the sound of the machine when it strikes a sulphur ball or other abnormal pocket.

Any partings are of course comminuted at the same time as the coal and are separated afterwards in the washing process. A fire hose leading from some source of water, under pressure, as a motor-driven centrifugal pump, enables a powerful stream of water to be thrown against the face of the coal while it is being cut, thus eliminating all dust and keeping the tools cold. The water thus projected against the coal carries away with it the comminuted product, which runs off to the nearest sump, whence it is pumped to any desirable destination. The machine owing to its power of advancing directly into the coal will cut a slope, an entry, a room, or work a long wall. In driving entries, or working rooms, advantage is taken of any grade so as to facilitate the drainage to the sump.

It is found that the violent jet of water so aids the breaking up of the coal by the cutter that the coal breaks clean to the floor and the roof, even though the cutters do not reach within several inches of either. It is found also that by cutting narrow rooms and leaving narrow pillars that timbering is largely done away with, and in some mines is rendered entirely unnecessary. The elimination of timbering, haulage and explosives and practically all of the hard labor are some of the advantages that are claimed for this system.

The machines at present being manufactured have a capacity for cutting 100 to 250 tons per day. This will be followed by much larger machines which will raise the possible tonnage per machine to 500. The machine will drive an entry 200 feet in one day. The mixed coal and water is handled by electrically driven centrifugal pumps with one or more stages, according to lift required. In dry mines the water, after being separated from the coal at the washer, is returned to the mine.

The machine possess all the advantages of being mounted on tracks, without the labor and inconvenience involved in laying the tracks in small sections. The machine, so to speak, carries its track with it, since it has shoes that are automatically advanced with its progress. This is found better than having the outfit on wheels since the latter cut up the floor too much; most coal-mine floors are more or less soft, especially when wet.

The new system contemplates the electric operation not only of the coal-milling machine and of numerous centrifugal pumps, but also of the ventilating equipment and of the entire lighting of the mine. All circuits will be thoroughly insulated and all switches will be of the oil-break type. The aim throughout is to reduce the hazards of the industry to a minimum and at the same time to increase the economy at every point by the use of the most modern and efficient machinery and methods. It is true that each installation will involve extensive electrical, mechanical and hydraulic equipment, but the economy of modern machinery over mule and human muscular effort needs no argument in the opinion of the inventors of the system. In this connection it is but fair to compare the present ways of handling coal and water. The former in small units is now moved from point to point by expensive carriers, dumped in one place only to be picked up and carried to another and from there hauled by some other vehicle to be deposited somewhere else, each handling imposing an additional cost and waste; on the other hand, water can be easily pumped and piped to its destination without manual intervention or rehandling.

It has been predicted for a number of years that American ingenuity would develop this art as it has so many others and that in spite of its discouraging environment something very much better in every way than the present imperfect and make-shift systems would emerge and take its right place as an economic factor in the commercial world. This, it would appear, has now occurred and no doubt within a very short time coal will be mined, transported and utilized in conformity with the advanced methods and apparatus of these engineers.

The machine described is manufactured by the Hoadley-Knight Coal Mining Company, 165 Broadway, New York City.

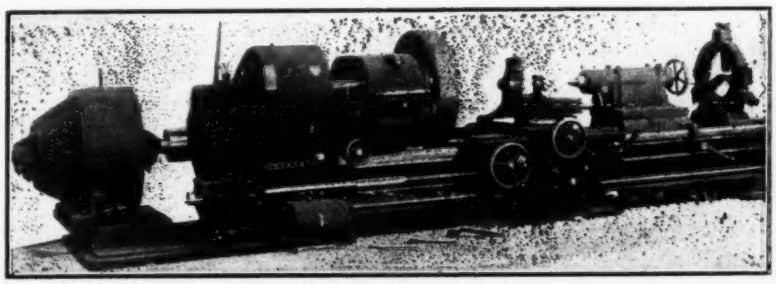
Motor-Driven 36-Inch Head Engine Lathe.

The accompanying illustration shows a Lodge & Shipley 36-inch standard triple-geared patent-head engine lathe driven by a direct-current 15-horsepower motor with a wide speed variation.

The lathe bed is equipped with ways built of chilled steel which very materially increase the life of the lathe and also preserve the alinement of the tool. The tail-stock spindle is of tool steel and is locked positively by a special locking device which not only eliminates the split-frame tail stock but also preserves the alinement of the spindle.

The lead screw is made of high-carbon ground stock, is chased in a special lathe designed for that purpose only, and is exceedingly accurate.

A distinguishing feature of the lathe is the back-gear quill that is made of steel instead of cast iron which is the usual practice. Quick-change drop-forged gears are used throughout and the apron gears are all steel except the cross feed and lateral friction gears which are of high-grade cast iron. The lathe is equipped with spindle bearings so made that should they be damaged by fire or other accident they can be replaced by a renewable white-metal bearing that is guaranteed to fit.



Motor-Driven Engine Lathe.

The motor driving this lathe is mounted at the end of an extension of the bed and is directly connected to the driving shaft. This motor, of the commutating-pole adjustable-speed direct-current type especially adapted for machine-tool work, is made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. The speed variation of from 450 to 900 revolutions per minute is obtained by means of a machine-tool controller, the accessibility of which is a particular feature of the lathe. The controller itself is mounted in a horizontal position on the bed plate of the lathe and the handle is located on the carriage just to the right of the position of the operator, making it very convenient for him to handle. The connection between the handle and the controller is made by means of a spliced shaft and miter gears.

Extension-Front and Compensating Electric-Vehicle Ampere-Hour Meters.

Owing to the demand for a type of ampere-hour meter which could be mounted on the rear side of a dash board or heel board, allowing only the dial to show in front, the extension-front Sangamo ampere-hour meter shown in Fig. 1 has been developed. The meter is contained in a very compact, solidly built, pair of aluminum castings, one forming the back and the other taking the place of the usual case, also carrying the supporting lugs for attaching to the vehicle. The cylinder tube projecting from the front is of such length as to go nearly through the support on which the meter is fastened. A friction-tight bezel ring and cap is slipped on the tube, after the meter has been fastened in position, making an attractive finish and giving the same effect or appearance as the distant-dial type of meter described in these columns in the issue of July 20, 1912.

Fig. 1.—Extension-Front Vehicle Meter.

The extension-front type of meter can be supplied with all the features of a standard ampere-hour meter, including zero contact, totalizing circles, etc. When it is desired to reset the hand, the bezel cap is removed and the hand can then be pulled slightly forward against a spring tension on its shaft, throwing it out of mesh with the driving gear on the recording train, after which it may be turned to any desired position and allowed to drop back in mesh. For cars so designed that the extension-front type ampere-hour meter can be placed under the back of the front seat with the dial showing on either the dashboard or heelboard, a very pleasing appearance is obtained, with extreme simplicity of arrangement.

Compensating Meter for Lead Batteries.—One of the most important improvements made is the compensation for the effect of high discharge rates on lead batteries. This has been developed to meet objections raised against the use of ampere-hour meters with lead batteris, not because of any trouble in the meter itself, but owing to the peculiarity of a lead battery in showing a considerable reduction in effective or useful capacity on discharge rates above normal. Because of this, users of ampere-hour meters on vehicles with lead batteries, particularly those built to run at high speeds, have sometimes been deceived by the indication of the meter as to the true amount of available capacity left in a battery, owing to the fact that the meter recorded true ampere-hours, when under such conditions it should record considerably more than the actual ampere-hours taken out, in order to compensate for the reduction in effective capacity of the battery.

Effect of High Discharge Rates on Lead Batteries.—The variation in effective capacity of a lead storage battery on varying discharge rates is illustrated by the curve in Fig. 2, taken from actual test on a lead vehicle battery. While every battery will not show exactly the same ratio of reduction in effective capacity with increasing rate, it may be taken as characteristic of lead batteries for vehicle use. It will be seen that the normal rate of this particular battery is 27 amperes for 5 hours, or a total of 135 ampere-hours. At a high rate, say 50 amperes, the effective capacity is only 98 ampere-hours. This does not mean that the other 37 ampere-hours of capacity has entirely disappeared if discharged at the 50-ampere rate, but this remaining capacity, after a high discharge rate has been employed, must be used at such a low rate that it is no longer effective for operation of a vehicle, or, in other words, it is not available.

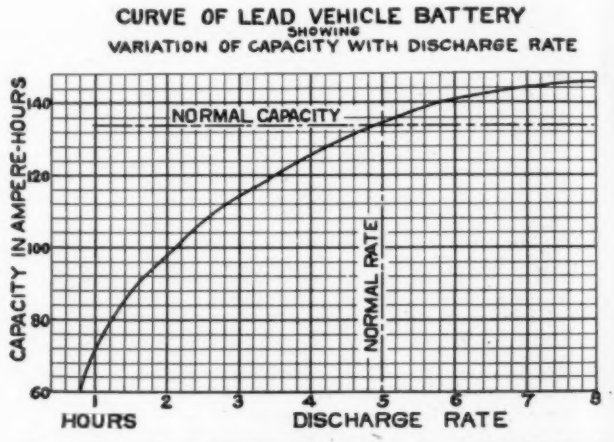


Fig. 2.—Reduction in Effective Battery Capacity at High Discharge Rates.

In vehicle service, it is the effective ampere-hours still available in a battery which is of importance, and not the capacity still in a battery which would have to be drawn out at so low a voltage and at so low a rate that it would be of no practical value.

Principle of Compensating Feature.—From the characteristics of a lead battery, it is evident why there has sometimes been trouble with ampere-hour meters subject to widely varying discharge rates. To meet this condition, the compensated type meter has been developed. The principle of this compensation consists in speeding the meter up on those discharge rates above normal rate of the battery by a ratio based somewhat upon the curve of Fig. 2. As a matter of fact, the compensated meter is not speeded up as much as the theoretical curve would indicate to be necessary, for it has been found in actual practice that the recuperation of a battery after high discharge rates, under ordinary operating conditions is so great that the effective capacity is not reduced to the extent indicated by a curve taken for a complete discharge at any given high rate.

The compensating feature of the ampere-hour meter is adapted to lead batteries with the widest possible variations in discharge rate, just as the ordinary or standard ampere-hour meter has been to Edison batteries, where the capacity is not appreciably affected by the discharge rate. The compensation on discharge is obtained by a small series-wound electromagnet, increasing the torque on discharge, and without any additional moving parts.

The new transporter bridge at Middlesbrough, England, spans the River Tees at a height of 177 feet. Suspended from it is an electrically driven ferry car that can carry 600 passengers and six vehicles.

An Electrically Operated Labor-Saving Device in Lumber Mill.

The use of electrically operated machines in woodworking plants has been the means of effecting many economies in their operation, so that it is not surprising to hear frequently of some new application of an electric motor in this industry. The application illustrated and described herewith has proved to be so much more efficient in operation than the method it superseded that a description of it may prove of interest.

The apparatus consists of an automatic hydraulically operated door-veneering machine installed in the plant of the Commercial Sash, Door and Blind Company, Beaver Falls, Pa. This plant is most completely equipped throughout with individual electric motor drive, a total of 24 motors being used. Some are mounted on the ceiling and others on the floor in places most convenient for driving their respective machines. Those mounted on the floor are placed in inclosures to protect them from the dust and dirt such as is usually prevalent in plants of this kind.

Electrically Driven Hydraulic Veneer Compress.

The veneer is placed on the door frames and when a sufficient number are ready, they are placed in the compress as indicated in the illustration, which shows 110 one and three-eighths inch frames piled in five rows. Two sets of I-beams are put in place one above and one below the frames, and turn-buckle clamps attached from one set to the other are tightened so as to hold the frame intact. After this has been done, the motor, mounted on the ceiling just above the compress, is started and the operator opens the valve which allows the hydraulic pressure to act. Gradually the carriage rises, compressing the frames until the pressure, as indicated by the gauge at the side of the machine, has reached the desired value. This value is usually from 1,300 to 1,600 pounds per square inch, depending on the nature of the wood to be compressed. A pneumatic safety valve automatically opens at any predetermined value, thus preventing any possibility of danger from excessive pressure.

It will be noted, on referring to the illustration, that the bottom portion of the compress is in the form of a truck. By means of this construction the material may be loaded directly on the truck which is then rolled to the compress on car tracks. When the desired pressure has been applied for a few minutes (about two, generally), the valve is opened; the pressure gradually relieved, and the truck returns to the normal position and is then rolled away.

As an example of the economy effected by this veneering machine, it should be noted that the time required for compressing is only about two minutes, while that required by the old hand-operated method was from four to five hours. With this method, the frames can be removed at once after they have been compressed, although it is generally customary to leave the clamps on for an hour or so, whereas in the older method it was necessary to have them on for several hours.

The plant is equipped throughout with Westinghouse induction motors, taking current from the central-station lines.

Johnson's Improvements in Hatch-Type Storage Battery.

It has long been known that the Hatch type of construction for posted lead storage batteries possesses some advantages, such as great porosity, light weight and thorough working of the active material. These are secured by employing unglazed porcelain or other earthenware grids in place of the customary lead or antimonious-lead grids. In the actual usage of such batteries, however, difficulties have developed that have hindered their commercial application. One of the most serious of these has been that imperfect contact between the active material and the lead conducting sheet that lies against its flat face has commonly resulted from the continual expansion and contraction of the active material during discharge and charge.

Fig. 1.—Cross Section Through Johnson Plate.

To overcome this and other difficulties, Gustavus J. Johnson, of Chicago, Ill., who has had much experience with batteries of this type of construction, has invented several improvements that were recently patented. This patent is, in a sense, a development of one issued to Mr. Johnson about two years ago. The more recent patent has been assigned to E. C. Tourtelot, of Chicago, Illinois.

A horizontal section of the type of plate used is shown in Fig. 1, in which the earthenware plate *A* is indicated as having vertical ribs *a*, which are crossed by similar horizontal ribs, thus

forming pockets for the reception of the active material *E*. The opposite side of the plate has vertical ribs a^3 only, forming long vertical channels for the free circulation of the electrolyte. Mr. Johnson provides a small hole a^4 in the thin web opposite the center of each pocket to still further increase the accessibility of the active material to the electrolyte and thus decrease the internal resistance at the beginning of charge. Against the face of *E* is laid a thin sheet of lead and against this is another plate with its active material in intimate contact with the sheet, which serves as a conductor to lead the current to and away from a pair of such plates constituting a single positive or negative unit plate. Formerly the size of Hatch cells has been limited by the size of the unit plates. Mr. Johnson increases the size of his finished plates, however, by assembling a group of units. Fig. 2 shows an assembled element consisting of 7 negative and 6 positive plates grouped in the usual manner. Each of these plates

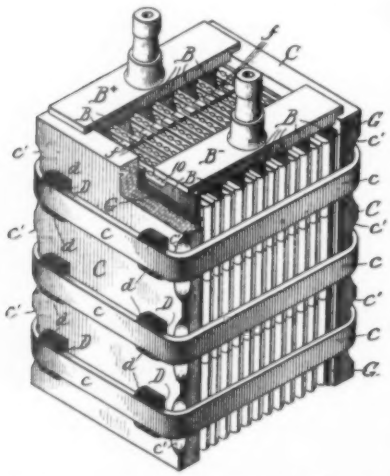


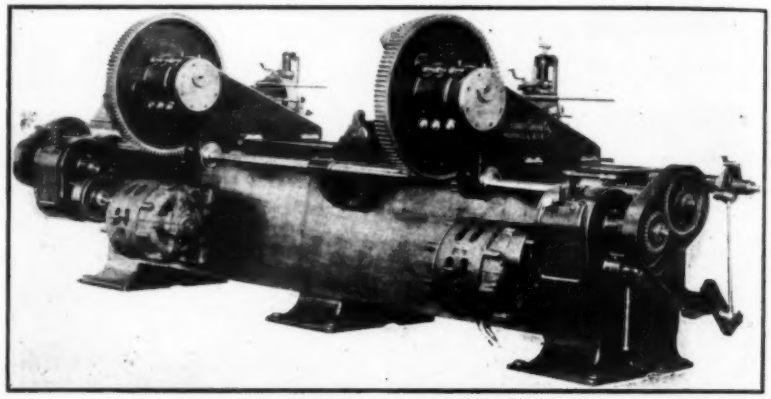
Fig. 2.—General View of Johnson Element.

is indicated as being made up of six units, two side by side and three high. A series of hard-rubber keys *f* holds the units together vertically. The outer side edges of the units have their edges rounded, as shown at a^5, and the extreme edge a^4 is rendered impervious to the electrolyte so as to render the side edges of the finished plate inactive and thus prevent their being short-circuited by the lead-antimony bands *c* that serve to bind the entire element together.

To provide a means for taking up expansion and contraction and that will insure keeping the lead electrode sheets in close contact with the active material, Mr. Johnson places an elastic rubber plate *G* between the end electrode plates of the element and the end supporting plate *C*. These will give the cell the necessary flexibility.

A Constant-Speed Motor-Driven Shaper.

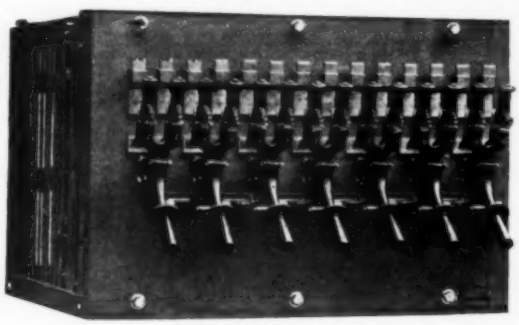
The method of electric drive used on the Cincinnati Shaper Company's type B, two-head shaper, shown in the illustration, is one of the most efficient and economical for the application of constant-speed motors to machine tools requiring different cutting speeds. Each head is driven by a separate Westinghouse induction motor. The two countershaft speeds, obtained by gears, are 158 and 205 revolutions per minute; additional gearing gives eight cutting speeds to the ram, amply sufficient for working all kinds of metal. The motors are designed for continuous service and constant speed on alternating-current circuits.



Motor-Driven Two-Head Shaper.

New Multiple-Switch Starter for Large Slip-Ring Motors.

The Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., has standardized, in sizes of from 60 to 600 horsepower, a multiple-switch starter for slip-ring induction motors. This



Starter for Slip-Ring Induction Motor.

type of starter handles heavy rotor currents and separate quick-break switches are used for cutting out successive steps of resistance. The operating levers of these switches are interlocked so that it is impossible to close them except in the proper order. The lever at the left is first pushed down, closing the switch, and the closing of the second holds the first in the closed position. Closing the third holds the first two, and so on. Tripping the last switch, either by means of a no-voltage release or by hand, throws all the switches open, inserting the resistance again for starting. The appreciable time required to close the switches, one after the other, is desirable as it prevents too rapid acceleration of the motor. Another feature is that with this type of starter part of the resistance cannot be left in circuit.

The auxiliary carbon and copper contacts and the quick-break action of the switch on opening practically eliminate arcing on the main contacts.

Electrically Driven Sewage Pumps at Dresden.

A new sewage pumping plant has been placed in operation at Dresden, Germany, that is entirely electrically driven. The sewage from both the old and the new town, which are located on opposite sides of the River Elbe, is brought to a central purification plant on the right bank of the river at Kaditz. It is then pumped into the center of the river by means of 8 motor-driven centrifugal pumps against a head varying from 0 to about 24 feet. The average flow amounts to some 1,300 gallons per second, whereas the maximum in case of storms may amount to some 4,300 gallons per second. The motors and their pumps are of different size and speed, thus giving a wide range of pumping equipment to fit any load. The total rating of the motors is 2,405 horsepower.

The pumping of sewage by means of electric motors is also gaining favor in this country.

Flashing Electric Lights on Auto Trucks

The latest development in auto delivery trucks brings into use electric signs, by which a decidedly forceful and effective means of advertising a business house is accomplished. Electric signs in any style can be furnished, such as a permanent name, or removable letters, or words to be changed daily.

A Reco flasher specially designed for this service flashes the sign first red, then pink, then white, then green, giving a beautiful and unusually attractive color-changing effect. Electrical effects practically without limit are possible with Reco flashers, such as spelling a word letter by letter, trade marks, fancy borders, lightning flashes, flaming torches, moving figures and in fact any effect obtained in electrical display signs can be duplicated on the auto truck. The flasher is very strong and compact and occupies a space 8 by 8 by 6 inches under the driver's seat.

The current to operate the sign flasher motor, as well as all other lamps, starter and ignition, is supplied by a new and simple system of generation; the surplus is transferred to storage batteries, which supply current while the engine stands still.

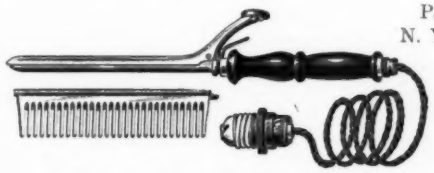
Truck Equipped With Flashing Electric Sign.

Unusual and effective publicity at slight cost may be obtained by this novel means. Department stores, wholesale and retail houses, as well as shops of every description, are adopting this effective form of advertising with gratifying results.

Reco flashers are the output of the Reynolds Electric Flasher Manufacturing Company, of Chicago and New York. This company supplies flashers operating large electrical displays in every representative city in the United States.

Combined Electric Comb and Curling Iron.

A very handy and doubly useful electric appliance that will be appreciated by the ladies has been placed on the market by the Pelouze Manufacturing Company, 232 East Ohio Street, Chicago, Ill. It is a combination electrically heated comb and curling iron. As shown in the illustration, the comb is readily slipped off thus making the device a simple curling iron. A single heating element answers for both purposes. The heater and cord are made so that they can revolve together to avoid kinking and rapid wear of the cord while in use.



Electric Comb and Curling Iron.

The heater is of such resistance for standard 110-volt service that it will not burn nor scorch the most delicate hair. The temperature is just right to do the most effective work. This, together with the fact that it will not become carbonized or soiled as a flame-heated iron, gives it a marked advantage over the old fashioned curler. The heated comb is particularly valuable for rapidly drying the hair after washing or shampooing, and is a still further time-saver in that it permits combing to be done during the drying. It is claimed that the heat also acts as as a tonic for the scalp and therefore is a promoter of luxurious hair.

This device is made in three styles—combined curling iron and comb, electric curling iron separate, and electric comb outfit separate. In each case the outfit is highly finished and makes a neat and serviceable addition to the equipment of the boudoir.

New Fixture Loops.

Pass & Seymour, Incorporated, Solvay, N. Y., have brought out two new devices which are illustrated herewith. One of these is a fixture loop to fit a standard one-eighth-inch cap socket; the other is a fixture loop with a long shank complete with brass hexagon nut for use in P. & S. rosette No. 200. Polished brass is the standard finish for these loops, but brush brass can be supplied if desired without additional charge.

P. & S. Fixture Loops.

Telephone Train Dispatching on St. Louis Southwestern Railroad.

That part of the St. Louis Southwestern Railroad Company's lines commonly known as the Cotton Belt Route has lately adopted the telephone for dispatching trains. To this end an order has been placed with the Western Electric Company for the entire equipment. The apparatus to be used is the No. 101-B selector set containing the standard No. 50 type selector, and 24 way stations will be so equipped along the line, which extends from Jonesboro, Ark., to Illmo, Mo., a distance of nearly 140 miles. The dispatcher is to be located at the latter point. Besides the telephone equipment, power equipment is to be furnished for generating the current to be used for signaling and talking. This consists of a single-phase motor direct connected to a direct-current generator, a power switchboard with accessories and 90 Chloride accumulators.

Who Makes the Electric Punkah?

The following communication has been received from W. R. Muckle, Art Club of Philadelphia, Philadelphia, Pa.; "Looking over your 1908 files I saw described an "Electric Punkah. Can you tell me who makes them, as I want to buy one?"

Excursion of General Electric Employees.

The Newark and Harrison, N. J., plants of the General Electric Company were closed on July 27, when the employees took their twelfth annual excursion to Asbury Park, N. J. Three special trains were provided for the occasion and about 2,500 participated in the excursion.

Direct-Current 2,400-Volt Railway in Montana.

The Butte, Anaconda & Pacific Railway between the copper mines at Butte and the smelter at Anaconda, Mont., is to be electrified. A 2,400-volt direct-current overhead trolley system will be used, this being the highest voltage as yet employed for direct-current railway purposes. The road has a main-line length of about 30 miles, although a total single-track mileage of about 90, including terminals and side tracks, will be electrically equipped. The traffic consists chiefly of hauling copper ore to the smelter and supplies back to the mines, a total of about 5,000,000 tons being handled a year. The heaviest freight train will consist of 50 loaded steel ore cars weighing 3,400 tons.

Fifteen freight locomotives and two passenger locomotives will be used at first. Each locomotive will be equipped with four 1,200-volt motors operated in series. These motors are insulated for 2,400 volts and are of the commutating-pole twin-geared type provided with forced ventilation.

Power will be obtained from the 102,000-volt lines of the Great Falls Power Company, one substation being located at Butte and the other at Anaconda. Each will contain two synchronous motor-generators, consisting of a three-phase 2,300-volt, 1,000-kilowatt motor and two 1,200-volt generators operated in series. All the electrical equipment will be supplied by the General Electric Company. This company reports a notable development recently in the demand for this apparatus.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CABINETS.—The Koschin Company, Manufacturer, 269 Clinton Street. Milwaukee, Wis.

Standard—National Electrical Code. Approved June 27, 1912.

CABINETS, SUPPORTS FOR.—The Electrical Manufacturing Company Manufacturer. 1951-1953 Lawrence Street, Denver, Colo.

Stamped steel brackets perforated with slots or holes for mounting bolts for convenience in adjusting and securing cabinets and outlet boxes in walls in the position desired.

Approved June 22, 1912.

CONDUIT, RIGID.—National Enameling & Manufacturing Company, Manufacturer, Youngstown, Ohio. For C. S. Knowles, Sole Agents, 7 Arch Street, Boston, Mass.

"Enamelduct," Black Enameled Conduit.

"Alumaduct," Galvanized exterior, red oxide baked enamel interior.

"Alumaduct Special," Red oxide baked enamel interior, galvanized and red enamel exterior.

Approved June 7, 1912.

CURRENT TAPS.—Benjamin Electric Manufacturing Company, Manufacturers, 42 West Jackson Boulevard, Chicago.

A combination of a swiveling Edison shell attachment plug with a twin keyless, brass-shell socket.

Multiple, Catalog Nos 942, 9002.

Series, Catalog Nos. 942.5, 9001.

Approved July 6, 1912.

FIXTURES.—Adams-Bagnall Electric Company, Manufacturer, Cleveland, O.

"Abolite" single-lamp unit fixtures of ceiling canopy, chain pendant and rigid stem styles.

Approved July 6, 1912.

FIXTURES.—Century Gas & Electric Company, Manufacturer, 419-421 E. Eighth Street, New York.

Electric and combination gas and electric fixtures shipped from the factory in knock-down condition, usually without being wired.

Approved June 22, 1912.

PNEUMATIC CLEANERS.—Monarch Vacuum Cleaner Company, Manufacturer, 1151 Broadway, New York. "Monarch" Vacuum Cleaner and Renovator.

This device is a portable motor-driven, centrifugal fan, suction cleaner, the operating parts being inclosed by a cylindrical sheet-steel casing. The motor, of a standard type, is rated at one-eighth horsepower, 10 volt-direct-current, and under conditions liable to be obtained in service requires over 250 watts.

Approved June 22, 1912.

SIGNS, ELECTRIC.—O. J. Gude Company, Manufacturer, 2001 Broadway, New York.

Standard—National Electrical Code. Approved July 8, 1912.

SIGNS, ELECTRIC.—National Sign Company, Manufacturer, 61-63 Hudson Street, Jersey City, N. J.

Standard—National Electrical Code. Code.

Approved July 8, 1912.

SWITCHES, KNIFE. — Crocker-Wheeler Company, Manufacturer, Ampere, N. J.

All capacities, 250 and 600 volts, National Electrical Code standard.

Approved June 22, 1912.

SWITCHES, KNIFE.—General Electric Company, Schenectady, New York.

250-volt, punched-clip, lever type, 30, 60, 100, 200 amperes, (with or without extensions for cartridge fuses).

600-volt, punched-clip lever type, 30 amperes (with fuses).

600-volt, punched-clip lever type 60-100 amperes (with or without inclosed cartridge fuse extensions).

Approved June 13, 1912.

SWITCHES, PENDANT SNAP.—Benjamin Electric Manufacturing Company, Manufacturer, 128 South Sangamon Street, Chicago, Ill.

This manufacturer is equipped to supply pendant-snap switches, with standard labels.

Approved June 4, 1912.

SWITCHES, PUSH-BUTTON FLUSH.—Machen & Mayer Electric Manufacturing Company, Seventeenth and Vine Streets, Philadelphia, Pa.

This company is equipped to supply push-button flush switches with standard labels.

Approved May 13, 1912.

SWITCHES, SURFACE SNAP.—Harvey Hubbell, Incorporated Manufacturer, Bridgeport, Conn.

"Hubbell," 3 amperes, 125 volts; 1 ampere, 250 volts.

An adaptation of the Standard Hubbell pull-socket mechanism without lamp holder and with closed brass shell with chain outlet centrally located at the bottom. Catalog No. 5795 with porcelain base. Catalog No. 5796 with metal-covered porcelain base.

Approved June 22, 1912.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

MILLER, NEB.—This town recently voted in favor of establishing an electric light plant.

FABIUS, ALA.—Flat Rock High School will install an electric light plant and water works.

MONROVIA, CAL.—Improvements in the lighting system here will be made in the near future.

LEHIGH, IOWA.—Bonds for $20,000 for an electric light plant and waterworks have been voted. C.

JOHNSTOWN, N. Y.—The City Council is considering the installation of a municipal electric light plant.

LOUISVILLE, ALA.—The Town Clerk has in charge a project to improve the electric lighting system.

ELDORA, IOWA.—A modern system will be installed, which calls for 40 electroliers of five lights each.

WAYZATA, MINN.—The Northern Power Company of Excelsior has been granted a franchise for electric lights.

LOS ANGELES, CAL.—A new lighting district is to be formed for the benefit of the people of San Fernando Valley.

ST. CLOUD, MINN.—Work will be started at once on the power line of the Union River Company, to Richmond. C.

TRENTON, N. J.—The City Council is negotiating with Newark engineers for plans for a municipal lighting plant.

NEWPORT BEACH, CAL.—A resolution has been passed declaring that the public interest demands a municipal light works.

PONTOTOC, MISS.—L. E. Price of Utica has purchased the local electric light plant, secured a new franchise and will improve system.

ABBEVILLE, GA.—G. W. Mixon will rebuild the electric light and power plant which was recently destroyed by fire, causing a loss of $5,000.

NEW BEDFORD, MASS.—The New Bedford Gas & Edison Light Company is making preparations to extend its electric service to Padanaram.

GREENFIELD, IND.—The City Council is advertising for material, supplies and machinery for the improvement of the municipal electric light plant. S.

MILWAUKEE, WIS.—The Committee on Highways and Bridges has recommended that electroliers be provided to illuminate the Grand Avenue viaduct.

EGYPT, PA.—A campaign has been begun for an electric light system here. O. E. Leh has formed a company of leading business men to push the project.

ELBERON, N. J.—The Deal Lighting Company, Long Branch, is understood to be planning for the installation of a conduit electric lighting system at Elberon. A.

MOUNT PLEASANT, UTAH.—A bond issue of $38,000 has been issued by the tax payers of this city for the purpose of installing a municipal electric light plant.

FAIRFIELD, CAL.—Bids will be received up to August 27 for the sale of a franchise for transmission lines in this town applied for by the Great Western Power Company.

LOS ALTOS, CAL.—By an almost unanimous vote it has been decided to establish an electric lighting system here. It is estimated that it will cost $1,000 to install this system.

RIVERSIDE, CAL.—The recommendation of the Board of Public Utilities for the installation of an ornamental lighting system has been approved by the city council.

WASHINGTON, D. C.—The Dixie Power Company has been granted the right to construct a dam across the White River in Arkansas for the purpose of developing water power.

WORCESTER, MASS.—The electric light company at this place is preparing to build a transformer plant so that it may be enabled to distribute current required by new consumers.

MADISON, IND.—The City Council is in the market for material and expert labor for the installation of a cluster lighting system. The former lighting system will be doubled and extensive improvements made. S.

LOS ANGELES, CAL.—Plans for the power plant to be erected in San Francisquito Canyon known as No. 1, which is to be built at a cost of $100,000, will be supervised by F. L. Roehrig.

NOBLESVILLE, IND.—A committee consisting of Councilmen Thom, Eller and Joseph have in charge the matter of the new street lighting system which is to be installed at this place.

DIXON, CAL.—The Great Western Power Company has applied for a franchise for transmission lines in this town, and bids will be received up to September 10 for the sale of said franchise.

LOS ANGELES, CAL.—The Public Service Commission has granted the Southern Sierras Power Company right of way for a power line across the aqueduct lands from the Bishop Creek power site.

HEBRON, N. D.—Hebron Electric Light & Power Company has been incorporated with a capital stock of $10,000 by Theodore Bolke and E. H. Mann, Hebron; Albert Hannes, Pelican Rapids, Minn.

CUMBY, TEX.—The City Commissioners have granted a franchise to erect and conduct an electric lighting plant in this place. It is expected that this plant will be finished and in operation in three months.

EARLVILLE, IOWA.—H. J. Jaeger, Dyersville, received the contract to install an electric light plant for the Earlville Electric Light Company. A complete system of street lights will be put in. C.

CHISHOLM, MINN.—Judge Page Morris has ordered the franchise and property of the Range Power Company to be sold on August 28. The claims aggregate $90,000. L. S. Loeb is receiver. C.

NEW YORK, N. Y.—Colliers Light, Heat & Power Company has been incorporated with a capital stock of $50,000 by Louis B. Grant, Brooklyn; Bart T. Cavanagh and Daniel P. Bergheimer, New York City.

OKLAHOMA, CITY, OKLA.—The Chamber of Commerce has perfected plans for the system of ornamental street lighting for this city and it is intended that the same will be in full operation by December 1.

LAURENS, IOWA.—Instead of erecting an electric light plant here a transmission line will be built to Rolfe, a distance of 17 miles, at a cost of $500 per mile, to connect with the lines from the water power plant at Humboldt. C.

EVERETT, WASH.—The Edmons Electric Light & Power Company has been granted a franchise to construct a pole line along Halls Lake road and to run a line along the Park road from Edmons to the King county line.

LESTER, W. VA.—Lester Light & Power Company has been incorporated with a capital stock of $10,000. The incorporators are E. M. Cannaday, J. Levi Coal, J. Q. Brooks, G. Y. Kelley, Lester; and Jarrell Bryson, Bryson.

CAMDEN, N. J.—The City Council has awarded a contract for the preparation of plans for a municipal electric lighting plant. It is proposed to have the same in operation at the close of the present contract with the Public Service Company. A.

VENTURA, CAL.—Articles of incorporation have been filed for the Moorpark Water, Light & Power Co., with a capital stock of $10,000, by R. E. Young, E. C. Graham, J. M. Cornett, R. C. Lydsto, J. C. Smith, F. M. Cornett and J. M. Stewart.

KANSAS CITY, MO.—Commerce Trust Company will install a plant in the sub-basement of its building for the purpose of furnishing heat, light and power to consumers within a radius of a block. It is estimated that the cost of this undertaking will be $75,000.

GLENDALE, CAL.—Manager Harry B. Lynch of this city's lighting is negotiating with Pasadena to serve Glendale with electricity during that time when the city's present contract

expires in November and at the time when the Owens River power is procurable.

COLUMBUS, IND.—The City Council has granted a 25-year franchise to the Inter-State Electric Company for light, heat and power. The company has bought water power sites near Edingburg and will improve the same at once to furnish electricity to Columbus and vicinity. S.

MANSFIELD, WASH.—Bids will be received up to August 15 for the purchase of general town bonds in the sum of $10,000, denominations not less than $100 nor more than $1,000, due in 20 years, issued to acquire the plant of the Mansfield Water & Light Company.

FRESNO, CAL.—The new power line of the San Joaquin Light & Power Company from the Fresno Copper mine to Strathmore is almost complete, and work will soon begin on the line which the company is to build to the coast, to connect its newly acquired plants there.

YORK, PA.—Harrison B. Waltman, Charles A. Greenwalt and James J. Gerry are named among the incorporators of a new electric power company which is being organized at this place for the purpose of furnishing light, heat and power to a number of townships in York County.

CLINTON, N. Y.—Thomas F. McBride of this place is the promoter of an enterprise which is to establish a gigantic hydroelectric plant at Whitney Point which will furnish electrical power for a trolley line between Utica and Binghampton and for commercial purposes to intermediate places.

SAN MATEO, CAL.—The Halfmoon Bay Light & Power Company has applied for permission to increase its capital stock from $25,000 to $100,000 in order to build 75 miles of extensions with which to serve practically all the towns on the Ocean Shore Railway in San Mateo County.

NEWARK, N. J.—The Board of Education will receive bids until August 22 for the construction of an addition to the Newton School House, which will include electric work, heating and ventilating and vacuum cleaning systems and electric lighting fixtures. R. D. Argue is secretary of the board.

ZIONSVILLE, IND.—Zionsville, a prosperous town between Indianapolis and Lebanon, is to be supplied with current for electric lighting from the suburban station south of the town. The plant of the Old Town Electric Light Company will be abandoned, and the new arrangement will give patrons a day service. S.

OMAHA, NEB.—F. A. Nash, president of the Omaha Electric Light & Power Company, has confirmed the rumor that stockholders of his company had arranged with Kountze Brothers, of New York, to build a power plant at Fremont, Neb., for the purpose of supplying electrical current to Omaha.

NASHVILLE, TENN.—The Nashville Railway & Light Company has two important extensions in view, one to Shelby Park and the other to Hyde's Ferry bridge. The first will enable a lot of traffic to an important new park to be handled and the other will develop a territory which promises much industrially. G.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

ANITA, IOWA.—It is planned to spend $5,000 in improving the Rural telephone system. C.

KIMBALL, MINN.—The Kimball-Maine telephone system was sold to Phillip Vollmar, of Alma, Wis. The system will be improved. C.

VIRGILINA, VA.—Granville Telephone Company has been incorporated with a capital stock of $10,000, by J. S. Watkins, J. M. Bennett and others.

SANTA ANA, CAL.—The Pacific Telephone & Telegraph Company has been granted a 20-year franchise for an underground system of conduits at this place.

ST. LOUIS, MO.—The Bell Telephone Company has agreed to place all telephone wires and cables in certain districts of Manchester Avenue underground.

BARABOO, WIS.—The Farmers' Telephone Company of Greenfield is preparing to build two more lines through East Greenfield and another line south. C.

SALYERSVILLE, KY. —Burning Fork Telephone Company has been incorporated by Louis Marshall, James H. Arnett, Butler Kelly, Oliver Patrick and others.

MATLOCK, WASH.—Matlock & District Telephone Company has been incorporated with a capital stock of $3,000 by John Wharton, Joseph Valley and others.

GRINNELL, IOWA.—The interior Telephone Company will rebuild its lines in this city, erect a brick central building and install dynamos and a gasoline engine for power. C.

PHILIPSBURG, N. J.—The Slate Belt Telephone Company has announced that it will spend upwards of $30,000 on improvements to the system in the vicinity of Bath.

CORPUS CHRISTI, TEX.—Corpus-Laureles Telephone Company has been incorporated with a capital stock of $1,500 by J. A. Hill, H. M. Stockton and P. E. Morgan, Corpus Christi.

LOS ANGELES, CAL.—The General Research Company has made application to erect two steel flag poles on the tops of tall buildings for the purpose of establishing a long-distance wireless telephone.

GASTON, IND.—The Broyles Telephone Company has been incorporated with a capital stock of $6,000. The directors are H. A. Broyles, Sherman Broyles, H. M. Long, C. M. Broyles and W. H. Broyles.

MENDON, ILL.—Menden & Loraine Farmers' Mutual Telephone Company has been incorporated with a capital stock of $645. The incorporators are J. A. Ausmus, S. M. Curless and Addison Curless.

YOUNGSTOWN, O.—The P. & L. E. railroad officials have announced that they will immediately install a telephone system of dispatching between this place and Pittsburg. The line will cost approximately $7,000.

PARSONS, W. VA.—The Duncan Telephone Company has been incorporated with a capital stock of $3,000 for the purpose of operating telephone lines. The incorporators are J. W. Duncan, Thomas; N. B. Miller and Maud Pennington, Parsons.

ELECTRIC RAILWAYS.

(Special Correspondence.)

COUNCIL BLUFFS, IOWA.—The street railway company will build at once an extension of the Benton and Harrison line. C.

ROCK ISLAND, ILL.—A party of Rock Island capitalists has launched a project to build an interurban from Aledo to Rock Island.

PHILADELPHIA, PA.—The Philadelphia Rapid Transit Company has under consideration building a crosstown trolley line in West Philadelphia.

MARIETTA, O.—The Parkersburg, Marietta & Interurban Company has obtained a franchise to make certain extensions to its street railway system.

WESTERLY, R. I.—Civil Engineer Frank Kromer of Norwich has been making a preliminary survey for the extension of the Ashaway and Westerly trolley line.

ST. PAUL, MINN.—The Commerce Association wants a belt-line street railway built by the St. Paul City Railway Company from Payne Avenue to West Seventh Street. C.

INDIANAPOLIS, IND.—The Indianapolis Traction & Terminal Company has notified the Board of Public Works that extensions will be made to the city street railway.

MOORHEAD, MINN.—The Fargo & Moorhead Street Railway has been assured of a right of way for the proposed Dilworth extension, a distance of five miles. Work will begin at once. C.

SUPERIOR, WIS.—The Superior Steel Plant Traction Company has been incorporated by J. J. Wirtz, W. C. Hurst and Robert Stewart with a capital of $100,000. A car line will be built on Central Avenue.

INDIANAPOLIS, IND.—Extensive improvements are to be made by the Union Traction Company of Indiana. Among other things, it is announced that a new route will be built into Indianapolis.

SANTA BARBARA, CAL.—The Cochran-Batchelder Company has been granted a 45-year street railway franchise and will reconstruct the local system at a probable cost of $250,000. Work will be started at once.

SANTA MONICA, CAL.—The Santa Monica Land Company plans for the construction of an incline electric railway on the Palisades at Ocean Avenue. The incline road will make connection with the Pacific Electric line.

SAN FRANCISCO, CAL.—The Board of Public Works has suggested that bids be called for the building of underground conduits, planned to carry the feeders and cables for the Geary Street railroad from Kearny Street to Presidio Avenue.

JENNINGS, LA.—S. B. Conover, president of the Lake Arthur, Jennings & Northern Railroad, has stated that in all probability the new road will be run by electrical power, furnished by a central plant which will cost $250,000 and be located in this place.

COLUMBUS, O.—The Columbus-Crosstown Car Line Company has been incorporated with a capital stock of $1,000. The incorporators are William I. Lawrence, Alvin J. Gasto, Horatio B. Atcheson, George M. Williams and Stanley D. Pugh.

TOLEDO, O.—At least $200,000 will be spent at once by the new owners of the Toledo, Port Clinton & Lakeside electric line on improvements to the system. The company will hereafter be known as the Northwestern Ohio Railway & Power Company.

PETALUMA, CAL.—Surveys are being made of the extension line of the Petaluma Electric Railroad, which will branch at Two Rocks, one line running to Valley Ford and the other to Tomales, then down Keys Rock, skirting Tomales Bay, to the beach.

SAN FRANCISCO, CAL.—The Northern Electric Railway Company has been granted permission to issue $600,000 of five-per-cent bonds, the proceeds to go toward the construction of the Marysville and Colusa branch and for a branch across the Sacramento River at Meridian.

HARRISBURG, ILL.—The City Council has granted a franchise to the Southern Illinois Railway Company to construct an electric trolley line through this city. This completes the right of way for the line from Carrier Mills to Eldorado and the building of the line is now assured.

LEWISBURG, PA.—John F. Whittaker, president, and D. F. Diehl, secretary, of the Lewisburg, Milton & Watsontown Street Railway Company, have been negotiating to finance the proposed trolley line to North Bend, and the prospects are that the road will be built within a year.

EL PASO, TEX.—Rio Grande Valley Traction Company has been incorporated with a capital stock of $300,000 for the purpose of operating an interurban between El Paso and Socorro, a distance of 16 miles. The incorporators are Edwin B. Parker, David Daly and C. R. Wharton, all of Houston.

PORTLAND, ORE. — William Sproule, president of the Southern Pacific Railroad, has selected Robert Strahorn to build for the company its proposed 350 miles of electric lines around and south from Portland at from $8,000,000 to $10,000,000, and to act as general manager of the new system when completed.

RICHMOND, CAL.—It is reported that the Southern Pacific Railroad has appropriated $1,085,000 with which to build its electric system into this city, using the Cutting boulevard and 10th Street franchises, under the terms of which work must begin by August 15. The statement is made that $50,000 is ready to start grading by that time.

MACON, GA.—The Atlanta & Macon Railway Company has practically completed its plans and surveys, and intends in the near future to start construction on its proposed high-speed third-rail electric road between Atlanta and Macon, a distance of 88 miles, via Jonesboro, Griffin, and Forsythe. C. G. Young, Bankers' Trust Building, New York, has been appointed consulting engineer representing the interests financing the railway.

ST. LOUIS, MO.—The St. Louis & Western Traction Company has filed articles of incorporation with the purpose of building an interurban railroad through West End Heights and Brentwood, north of Webster Groves, Glendale, Kirkwood, Avondale, Des Peres and Valley Park to Manchester, Ballwin and Ellisville. The incorporators of the new company are: J. D. Housemman, Powell Johnson, Richard K. Papin, John Brenan, Jr., Matthew T. Chestnut, William R. Harrison and Charles F. Redman, and the capital stock is $300,000.

NEW INCORPORATIONS.

LOUISVILLE, KY.—The Louisville Gas & Electric Fixture Company has been incorporated with $2,000 capital stock and will deal in the merchandise indicated. Edward T. Martin, Harry D. Catlett and I. P. Barnard are the incorporators. G.

ROCK ISLAND, ILL. — Franks Manufacturing Company has been incorporated with a capital stock of $30,000 for the purpose of manufacturing and dealing in electrical fixtures and novelties. The incorporators are: W. L. Franks, Edward Peters and Eugenie Franks.

LOUISVILLE, KY.—T. I. Burks & Company has been incorporated for the purpose of manufacturing player pianos. A specialty will be made of player attachments to be installed in manual pianos. The company will equip its plant with motor-driven wood-working machinery.

COLUMBUS, O.—The Dillon Electric Company has been incorporated with a capital stock of $10,000 by Charles A. Dillon, Charles A. Kuehn, William F. Dillon, Howard B. Dillon and James F. T. Walker. The company will do a general electrical supply and machine business.

STEPHENS, ARK.—Articles of incorporations have been filed by the Northum Telephone Toll Register Company with a capital stock of $25,000. The incorporators are H. H. Medlock, A. O. Green, Ralph Nixon, Fred Nixon, G. T. Griner, J. D. McClurkin and E. M. Northum.

ST. LOUIS, MO.—Cornwell Electric Company has been incorporated with a capital stock of $3,000 by Benjamin S. Cornwell, William H. Chresinger, Willa W. Wiley. The purpose of the company is to do a general electrical, construction and manufacturing and vending of electrical supplies.

ST. CATHERINES, N. Y.—The Ritter Illuminating & Manufacturing Company has been incorporated with a capital stock of $75,000 for the purpose of manufacturing and dealing in electrical apparatus. H. K. Ritter, C. K. Merritt, G. R. Burson, Miss N. L. Nelson and Miss Mary C. Houston, St. Catherines, are the directors.

PROPOSALS.

CAPSTANS.—Sealed proposals indorsed "Proposals for Capstans" will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until August 31 for furnishing three electrically-driven dock capstans at the Navy Yard, Mare Island, Cal. Plans and specifications may be obtained upon application to the Bureau or to the commandant of the navy yard named.

CABLE, HANGERS, AND TORCHES.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until August 26 for the following material:

Article.	Quantity	Delivery at navy yard	Sch
Cable, lead-sheathed	5,000 feet	Brooklyn, N. Y.	4750
Hangers, insulator	400 feet	Brooklyn, N. Y.	4748
Torches, gasoline	75 feet	Brooklyn, N. Y.	4756

UNDERGROUND SIGNAL AND TELEPHONE CABLE.—Sealed proposals will be received at the office of the Commissioners of the District of Columbia, Washington, D. C., until August 15 for furnishing and delivering through the fiscal year ending June 30, 1913, underground signal and telephone cable for use in the Electrical Department, this city. Specifications may be obtained from the purchasing officer.

ELECTRIC PASSENGER ELEVATOR.—Sealed proposals indorsed "Proposals for Passenger Elevator" will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until August 31 for installing one electric passenger eleavtor in the naval hospital at the Navy Yard, Puget Sound, Wash. Plans and specifications may be obtained upon application to the Bureau or to the commandant of the navy yard named.

ELECTRIC CONDUITS AND WIRING, AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until August 16 of a two-story building for the post office at Franklin, La.; until August 21 for electric conduits and wiring and interior lighting fixtures for the post office at Frostburg, Md.; until August 26 of a one-story building for the post office at Punxsutawney, Pa.; until August 27 of a two-story building for the post office at Santa Barbara, Cal.; until August 29 of the extension of the post office at Traverse City, Mich.; until August 30 of the post office at North Tonawanda, N. Y.; until September 5 of a two-story building for the post office at Rapid City, S. D. Copies of the drawings and specifications may be obtained from the custodians of the various sites or from the office of the Supervising Architect.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following items should address the Bureau of Manufactures, Washington, D. C., and refer to the file number noted.)

No. 9,225. Power Plant.—The American Consulate at Kingston, Canada, reports that additions and extensions to the city plant and building of the electrical generating plant were approved by the Kingston Council on the recommendation of the Utilities Committee, and tenders will be called immediately for the installation of a 500-kilowatt A. C. generator and the erection of a new building, the estimated cost of the additions and extensions to be $50,000.

No. 9290. Electrical Apparatus and Supplies.—Several weeks ago a meeting of prominent residents of a Far Eastern city was held to discuss the proposed formation of an electric tramway company, and at the last meeting it was decided to widen the scope and enter the field for electric light and power; the capital stock being raised to about $850,000. The details of the organization will be worked out later. The consul who furnished this information states that in the meantime letters and catalogs of electrical machinery should be addressed to a person named in the report.

FINANCIAL NOTES.

It is expected that the August crop report will indicate a full five per cent improvement over that given for July, and already banks are getting ready for a record outflow of cash for crop moving purposes. But little significance seems to attach itself to the political situation. By the time another week shall have passed the issues will be clearly defined, and a more definite conclusion drawn as to the probable effect the campaign will have upon progress and a return to a more substantial prosperity.

The Chicago Telephone Company has reported an increase of 10,000 telephones during the first half of this year. Earnings for the same period were $6,900,000.

The Portland Railway, Light & Power Company has appointed the Columbia-Knickerbocker Trust Company, New York City, agent for payment of coupons of its $75,000,000 first and refunding sinking-fund of five-per-cent bonds. Coupons due August 1 will be paid at the trust company's office, 60 Broadway, New York.

All of the issue of $500,000 five-per-cent collateral-trust sinking-fund bonds of the American Railway & Lighting Company have been called for payment, at 103 and interest, at the Equitable Trust Company, New York City, September 1, 1912. The bonds were issued March 1, 1907, and the sinking fund of $5,000 a year began to operate March 1, 1912.

The Philadelphia Stock Exchange announces that the voting trust agreement of the Keystone Telephone Company, dated July 1, 1905, having expired, the common stock voting trust certificates representing stock deposits, are now exchangeable for certificates of common stock of the company. The stock list committee rules that the common stock voting trust certificates of the Keystone Telephone Company, odd lots as well as hundred shares, shall be a delivery by certificate and power of transfer until such time as they shall be stricken off the list of the exchange, of which date due notice will be given.

Dividends.

Boston Elevated Railway Company; a regular semiannual dividend of three per cent, payable August 15.

Minneapolis General Electric Company; Stone & Webster have announced an extra distribution of $1.47½ a share on the common and 88½ cents a share on the preferred stock of the Minneapolis General Electric Company to all stockholders of record at the time of the sale of the property to H. M. Byllesby & Company for the Consumers Power Company.

Mobile Electric Company; a quarterly dividend of 1.75 per cent, payable August 15 to stock of record July 31.

Portland Railway, Light & Power Company; a quarterly dividend of $1 per share, payable September 3 to stock of record August 3.

Reports of Earnings.

NEW ORLEANS RAILWAY & LIGHT.

The New Orleans Railway & Light Company reports for the six months ended June 30, 1912, compared as follows:

	1912	1911
Gross earnings	$3,342,493	$3,195,053
Net after taxes	1,354,137	1,232,915
Surplus after charges	531,456	426,450

DAYTON POWER & LIGHT COMPANY.

The Dayton (O.) Power & Light Company reports for June and for the twelve months ended June 30 as follows:

	1912	1911
June gross	$46,971	$44,475
June net	22,526	17,907
June net income	7,763	2,712
Twelve months' gross	654,846	597,374
Twelve months' net	311,452	249,102
Twelve months' net inc.	148,373	71,427

The company operates the electric light and power utilities of Dayton, Ohio. It has $3,503,000 of common and $1,387,500 of six-per-cent preferred stock outstanding.

CONSOLIDATED GAS OF BALTIMORE.

The Consolidated Gas, Electric Light & Power Company, of Baltimore, has issued a report for the year ended June 30, which compares as follows:

	1912	1911
Gross income	$5,465,287	$4,867,776
Expenses and taxes	2,642,487	2,455,440
Net	2,822,399	2,412,336
Fixed charges	1,417,267	1,377,403
Surplus	1,405,131	1,034,932

MEXICO TRAMWAYS.

The Mexico Tramways Company reports for the year ended December 31, 1911, (U. S. currency), surplus after charges, $1,383,350. Dividends amounted to $1,154,118, leaving a balance of $229,232. Profit and loss surplus as of December 31, 1911, was $786,566, and reserve account $2,600,000. This company is a subsidiary of the British syndicate, headed by Dr. F. S. Pearson of New York and which also owns the Mexican Light & Power Company.

TWIN CITY RAPID TRANSIT.

The report of the Twin City Rapid Transit Railroad Co., for June and six months ended June 30, 1912, compares as follows:

	1912	1911
June gross	$692,417	$681,502
Expenses	335,853	326,349
June net	356,564	355,154
Charges and taxes	143,079	140,079
June surplus	213,485	215,074
Six months' gross	3,926,120	3,781,952
Expenses	2,048,606	1,928,794
Six months' net	1,877,515	1,853,158
Charges and taxes	855,475	840,475
Six months' surplus	1,022,040	1,012,683

UNITED RAILWAY, GAS & ELECTRIC.

The Union Railway, Gas & Electric Company, operating gas, electric light, power and traction properties in Illinois and Indiana, reports for June, the six months ended June 30, and the twelve months ended June 30, 1912:

	1912	Increase
June gross	$272,713	14.87%
June net	120,085	14.88
June surplus	41,259	18.43
Six months' gross	1,751,318	15.34
Six months' net	753,582	12.37
Six months' surplus	289,646	12.55
Twelve months' gross	3,422,972	11.53
Twelve months' net	1,544,729	9.95
Twelve months' surplus	648,598	10.30
Balance after preferred dividends, 12 months	333,823	22.06

The balance of $333,823 for the twelve months, after the payment of $314,775 dividends on preferred stock, is equivalent to 5.56 per cent on the $6,000,000 of common stock outstanding.

CLEVELAND, SOUTHWESTERN & COLUMBUS

The Cleveland, Southwestern & Columbus Railway Company, operating traction lines in eastern Ohio, reports for June and for the six months ended June 30:

	1912	1911
June gross	$105,172	$99,636
June net	45,635	44,757
June surplus	14,640	15,183
Six months' gross	540,343	520,166
Six months' net	209,785	217,935
Six months' surplus	27,718	41,763

While for the month and the six months good gains were shown in the gross revenues, the increase in operating expenses and in interest and taxes more than counter-balanced these increases, and a decrease is shown in net income for both periods. As it required $55,300 to pay the dividends for the six months on the $2,412,000 of preferred stock outstanding, it will be seen that these dividends were but half earned. For 1911 the company earned its preferred dividends, and about $20,000 additional for the $4,182,500 of common stock outstanding.

STONE & WEBSTER PROPERTIES.

Stone & Webster have issued a combined statement of the capitalization and earnings, for the year ended December 31, 1912, of the electric railway, electric lighting, power and gas companies managed by the Stone & Webster Management Association. The showing of these properties is excellent, and the magnitude of the interests of the firm and the earning qualities of the properties will be a surprise to many who have not kept in touch with the great growth of public utility properties in the last few years.

The earnings of the thirty-eight companies for the year ended December 31, 1911, were:

Gross earnings	$22,848,480
Operating expenses and taxes	13,815,732
Net earnings	9,032,747
Interest charges	3,692,878
Net operating revenue	5,339,869
Income from other sources	121,386
Total net income	5,461,255
Dividends paid	3,367,775
Surplus	2,093,479

The thirty-eight operating companies have bonds and coupon notes outstanding aggregating $77,901,500, $30,447,900 of preferred stocks, and $53,183,200 of capital and common stocks outstanding, or an aggregate capitalization of $161,532,600.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 5.	July 29
Allis-Chalmers common (New York)	*1⅛	1¼
Allis-Chalmers preferred (New York)	4½	4
American Tel. & Tel. (New York)	145⅜	145¾
Commonwealth Edison (Chicago)	138½	139
Edison Electric Illuminating (Boston)	297½	295
Electric Company of America (Philadelphia)	*12¼	12¼
Electric Storage Battery common (Philadelphia)	56½	55¼
Electric Storage Battery preferred (Philadelphia)	56½	55¼
General Electric (New York)	181¼	182½
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	2	2
Massachusetts Electric common (Boston)	18⅝	18½
Massachusetts Electric preferred (Boston)	94	*93
National Carbon common (Chicago)	118½	117
National Carbon preferred (Chicago)	118	119
New England Telephone (Boston)	152	153½
Philadelphia Electric (Philadelphia)	23¼	23⅜
Postal Telegraph and Cables common (New York)	88	87
Postal Telegraph and Cables preferred (New York)	69	69¾
Western Union (New York)	81½	81⅝
Westinghouse common (New York)	82	73½
Westinghouse preferred (New York)	123	122

*Last price quoted.

PERSONAL MENTION.

WILLIAM LESLIE HOOPER, professor of electrical engineering, has been appointed acting president of Tufts College.

I. A. SMOOT, manager of the Provo District of the Mountain States Telephone and Telegraph Company, has tendered his resignation.

JOHN ZELENY, professor of physics, has been appointed acting dean of the Graduate School for the coming year, at the University of Minnesota.

CHARLES H. PARKER, assistant superintendent of the generating department of the Boston Edison Company, is traveling in Europe, combining business with pleasure.

ANDREW J. KELLY has been appointed superintendent of the Newark, N. J., power plants of the Public Service Electric Company. D. J. Gray has been made his assistant.

R. L. BURNETT, industrial engineer, Public Service Electric Company, Newark, N. J., has been appointed electrical and gas engineer of the Department of Public Works, Providence, R. I.

JAMES T. WHITTLESEY, chief engineer, Public Service Electric Company, Newark, N. J., has resigned. It is understood that Mr. Whittlesey will take up his residence in California.

H. R. WARFIELD appointed president of the West Virginia Traction & Electric Company and will assume personal charge of the system. Mr. Warfield's headquarters will be at Wheeling, W. Va.

WILHELM OSTWALD, formerly professor of chemistry in the University of Leipzig, and well known for his contributions to physical chemistry and electrochemistry, expects to visit the United States in the autumn.

GEORGE H. HARRIES, president of the Louisville Gas Company, will be the new general manager of the Minneapolis General Electric Company, and all the united properties of the H. M. Byllesby Company in Minnesota.

EDGAR F. SMITH, provost of the University of Pennsylvania, and vice-president of the American Electrochemical Society, received the degree of Doctor of Science upon the occasion of the bicentenary celebration of Trinity College Medical School, Dublin, Ireland.

PAUL SHOUP, formerly vice-president and general manager of the Pacific Electric Company, Los Angeles, Cal., has been made president of the company, which is a subsidary of the Southern Pacific Railroad. The former president, William F. Herrin, has retired.

B. H. HAGEDORN has recently taken the position of city salesman and manager of the Chicago branch office of the Haskins Glass Company, which was recently vacated by A. H. Krom. Mr. Hagedorn is a glass salesman of long experience, having had charge of the Southern territory for the Haskins Glass Company for a number of years.

A. W. NYE, professor of electrical engineering, University of Southern California, Los Angeles, has made application for the position of electrical engineer of the Fire Alarm and Police Telegraph Bureau. He offers to give one-half his own time and employ an expert to give his entire time for the lump sum of $250 per month. He places the university laboratory and equipment at the city's free disposal if his proposition is accepted.

W. N. HOBART, president of the Triumph Electric Company, has celebrated his golden wedding anniversary. Mr. Hobart was married on June 12, 1862. He is still characterized by unbroken health and a vigorous activity that are the wonder and admiration of all who know him. Members of the Triumph Company presented Mr. Hobart with a signed memorial of congratulations and a handsome bouquet of American Beauty roses.

JOHN G. LEARNED, general contract agent for the Northern and Western Divisions of the Public Service Company of Northern Illinois, was on August 1 appointed assistant to the vice-president. Mr. Learned has been actively engaged in central-station commercial work for a number of years, having first entered the field as solicitor for the Commonwealth Electric Company in 1900. After five years of experience in this capacity, he was, on April 1, 1905, made general contract agent for the North Shore Electric Company, having entire supervision of 1,200 square miles of territory served by this company. Mr.

John G. Learned.

Learned held this position until November 11, 1911, when the North Shore Electric Company increased its holdings and became part of the Public Service Company of Northern Illinois, he then being made general contract agent for the Northern and Western Divisions. In his new position Mr. Learned will report to Charles A. Munroe, vice-president of the company, in the management of commercial-department affairs in all territory served by the company. Mr. Learned has been one of the most active members of the N. E. L. A. Commercial Section and at the past two conventions presented reports on the use of Electricity in Rural Districts, which are now considered among the most valuable contributions on the subject.

E. S. KIEFER, formerly construction department manager of the Western Electric Company, will hereafter be connected with the company in the capacity of special representative, closely co-operating with the managers and sales managers of the various branches of the Western Electric Company in studying the problem of soliciting the business of and adequately serving the contracting trade. The company has discontinued the electric light wiring and construction department.

NORMAN B. HICKOX, manager of the New Business Department of the Muskogee Gas & Electric Company, Muskogee, Okla., has been made manager of the Greenwood Advertising Company, at Knoxville, Tenn., and will assume his new duties August 15. Mr. Hickox has been at Muskogee for the past three years, during which time that city has gained an enviable reputation as one of the brightest and most thoroughly electrified cities of its size in the country. As to electric signs, Muskogee has more per capita than any other city in the country. Practically all power is electrical, and in store and residence lighting it ranks high. Before going to Muskogee, Mr. Hickox was employed to look after new business matters for a syndicate headed by S. S. Bush, of Louisville, Ky.

OBITUARY.

WILLIAM C. FINK, assistant secretary and treasurer of the Bell Telephone Company of Pennsylvania, died on August 4 at Atlantic City, N. J. Mr. Fink had been ill for several weeks with blood poisoning, but was thought to have recovered from the disease.

R. P. GILLETTE, for many years manager of mechanical sales of the Minneapolis Steel & Machinery Company, Minneapolis, Minn., was struck by lightning, July 12, while standing under a tree on the golf links at Minneapolis, and killed instantly. Mr. Gillette was a young man, highly esteemed by all who came in contact with him, and his untimely death will be mourned.

WILL B. CROWLEY, one of the leading lawyers of Central New York, died at his home in Syracuse on the evening of Tuesday, July 30, after an illness of nine weeks. He was 43 years old. Mr. Crowley was graduated with honors from the classical course of the College of Liberal Arts, Syracuse University, in 1889. He was admitted to the bar in 1891. Although seldom engaged in trial work, Mr. Crowley was one of the most brilliant lawyers in Central New York, having under his direction a large number of cases involving large sums of money and intricate questions of law. He was one of the few Syracuse lawyers to appear before the Supreme Court of the United States. The funeral was held on Friday afternoon, and that morning the bar association of Syracuse held a special meeting and passed a memorial tribute, a number of prominent gentlemen speaking feelingly and eloquently of Mr. Crowley's ability and high character. On January 23 of this year Mr. Crowley was married to Miss Gray Price, daughter of Mr. and Mrs. Charles W. Price, of Brooklyn, N. Y.

NEW PUBLICATIONS.

HORSEPOWER AND KILOWATT.—The Bureau of Standards, Washington, D. C., has issued circular No. 34 entitled "The Relation of the Horsepower to the Kilowatt." This circular points out the discrepancies in the values of the horsepower as given by different authorities and its variability with variations in gravity according to the usual definition. The history of this unit and its equivalent in European countries are discussed and it is stated that the Bureau of Standards uses the value of 746 watts to represent the horsepower. The use of the kilowatt is favored.

DATES AHEAD.

Electrical Supply Jobbers' Association, Niagara Falls, Canada, August 13-15.

Electrical Contractors' Association of Wisconsin. Annual meetings, Chain-of-Lakes, Wis., August 15-17.

Georgia Section, National Electric Light Association. Annual meeting, Tybee, Ga., August 15-17.

International Association of Municipal Electricians. Annual convention, Peoria, Ill., August 26-30.

American Electrotherapeutic Association. Richmond, Va., September 3-4.

International Association for Testing Materials. Sixth congress, New York City, September 3-7.

Pennsylvania Electric Association. Annual convention, Bedford Springs Hotel, Bedford Springs, Pa., September 4-6.

Eighth International Congress of Applied Chemistry. Washington, D. C., September 4, New York, N. Y., September 6-13.

American Electrochemical Society. Fall meeting in conjunction with Electrochemical Section of International Congress, New York, N. Y., September 7, 9 and 10.

Association of Edison Illuminating Companies. Annual convention, Hot Springs, Va., September 10-12.

Illuminating Engineering Society. Annual convention, Hotel Clifton, Niagara Falls, Ont., September 16-19.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Pfister, Milwaukee, Wis., September 23-28.

The 1912 Boston Electric Show, Mechanics' Building, Boston, Mass., September 28-October 26.

American Electric Railway Association and its five affiliated associations. Annual convention, Chicago, Ill., October 7-11.

The New York Electrical Exposition and Automobile Show. The New Grand Central Palace, New York City, October 9-19.

New England Section of the National Electric Light Association. Fall meeting, Boston, Mass., October 10 and 11.

Sons of Jove. Annual convention, Pittsburgh, Pa., October 14-16.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Manhattan, Kans., October 17-19.

With the Electrical Manufacturers

Fairbanks, Morse & Company has completed remodeling its Louisville quarters, metal ceiling being installed and the general offices and show-rooms rearranged. Improved illumination has also been put into effect, and the general appearance of the building greatly enhanced.

The Morgan Engineering Company, Alliance, O., has received an order amounting to $500,000 for electric cranes from the Minnesota Steel Company, at Duluth. The cranes are from 10 to 150 tons in capacity. This order is said to be the largest single crane order in the history of the country.

Superior Electric Manufacturing Company, 2412 University Avenue, S. E., Minneapolis, Minn., has issued a catalog describing its electrical distributing apparatus. This covers switchboards and panels of various types as well as cabinets and other kinds of inclosures. The catalog is handsomely illustrated and contains in addition price lists of the various products.

Richardson-Phenix Company, Milwaukee, Wis., has issued a 50-page book entitled "Scientific Lubrication of Machinery." It includes a complete description of the company's individual oiling and filtering systems and shows how these have very materially reduced the oil consumption in many plants. It also describes the design and operation of power-plant oil filters, sight-feed oilers and many other novel lubricating appliances.

The Mechanical Appliance Company, Milwaukee, Wis., maker of Watson motors and ventilating fans, is distributing a 12-page booklet describing and illustrating the Watson line of ventilating fans, including sizes from 18 to 42 inches. Data on how to determine the required ventilating-fan capacity and a chart are also contained. This information is for various classes of buildings, such as theaters, factories, halls, etc.

H. W. Johns-Manville Company, New York, N. Y., has issued hand book No. 409, which gives engineering data for use of Frink reflectors and the J-M Linolite system. It contains a definition of the terms used in the literature on illumination, lamp data and information applying to lighting of showcases, pictures, coves, show windows, signs, banks and other special types of installation. Curves of distribution and illustrations of the various fixtures of this company are given.

Allis-Chalmers Company, Milwaukee, Wis., has issued bulletin No. 1627 dealing with hydraulic turbines of the vertical type for low heads. Single, twin and triplex open-flume turbines are described, and power and speed tables given for various effective heads and diameters of runner for types E and F for both 25 and 60 cycles. These types of turbines are recommended for water-power projects where the heads range from 10 to 30 feet, where there is considerable variation of forebay and tail-race levels.

Emerson Electric Manufacturing Company, St. Louis, Mo., has issued bulletin No. 3711, which describes laboratory lathes for alternating and direct current. The direct-current lathes have three speeds, while the alternating-current lathes run at one speed only. Both are portable and are very convenient and almost noiseless. A pulley is supplied from which other light machines may be run. These lathes are designed especially for the requirements of dentists and each is furnished with chucks and polishing and grinding wheels.

Sprague Electric Works of General Electric Company, 527 West Thirty-fourth Street, New York City, has issued bulletin No. 902, which is devoted to Sprague electric grab-bucket cranes for handling bulk materials, such as coal, ashes, ore, crushed stone, etc. These cranes are made for monorail, gantry or bridge service and in all cases are equipped with very simple, rugged and foolproof control. The motors are either direct-current or polyphase and are equipped with magnetic brakes. The bulletin describes the equipment fully and has a large number of illustrations showing its adaptability for various classes of service.

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., announces that at a meeting of stockholders held on July 29 it was decided to liquidate the present corporation. This action is not taken because of any financial trouble, but because it is realized that the plant and investment are too large to carry on profitably the present business. Plans are under way to form a new corporation which will continue the business of the old company, taking over such portion of the plant, machinery, merchandise, etc., as can be advantageously utilized. The new corporation will be owned by substantially the same people as the old and will be equally well equipped to meet the requirements of customers promptly and efficiently.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has just issued a series of descriptive leaflets (Nos. 2465 to 2473) illustrating the new line of switchboard seven and nine-inch indicating meters. In each leaflet is a full-sized facsimile of the meter dial, the purpose being to present a correct idea of the actual appearance of the meter when installed. By placing these leaflets on the wall an accurate idea of the readability of the meter may be gained from any distance and angle. Descriptive leaflet No. 2494 fully illustrates and describes the Westinghouse synchronous booster rotary converter. This machine consists of a standard converter in combination with a revolving-armature, alternating-current generator mounted on the same shaft with and having the same number of poles as the ammeter by means of which the direct-current voltage delivered may be varied. Commutating-pole, direct-current motors for compressors, blowers, pumps, etc., are described in leaflet No. 2499.

Record of Electrical Patents.

Issued by the United States Patent Office, July 30, 1912.

1,033,786. Magneto-Battery Switch. H. G. Cox, Detroit, Mich. For opening and closing the ignition circuit and connecting in either the battery or magneto.

1,033,796. Electrical Switch. M. D. Greengard, New York, N. Y. Includes a ratchet wheel and pawl with two toes.

1,033,799. Electric Heater. J. E. Harvey, Milton Mass. A water heater with the resistance element around the vessel.

1,033,813. Arc-Lamp Construction. A. A. Low, assignor to M. J. Wohl and H. Hertzberg, New York, N. Y., and A. A. Low, Horseshoe, N. Y. The carrier block for the movable electrode slides between two guide rods from which it is separated by antifriction insulating balls.

1,033,816. Heating Apparatus. G. Machlet, Jr., Elizabeth, N. J. Includes an electric regulator composed of a voltmeter and a co-operating tactor dipping into the path of the voltmeter needle; has 110 claims.

1,033,817. Telephone Wall Set. R. H. Manson, assignor to Dean Electric Co., Elyria, O. Relates to details of the wall board and box construction.

1,033,840. Magnetic Speedometer. J. K. Stewart, Chicago, Ill. Includes a rotatable magnet in the form of a split ring and a thermostatic device for extending one magnet pole toward the other.

1,033,859. Bank of Keys. C. A. Bals, assignor to Corwin Telephone Manufacturing Co., Chicago, Ill. A set of reciprocating-plunger keys for selective telephone ringing.

1,033,867. Electric Heater. A. P. Blenkner and B. Z. Smith, Mountain Home, Idaho. An electric face-steamer with heating elements in its walls.

1,033,868. Steam Turbine. T. Bodde, Northfield, Vt. A vertical-shaft reaction conical apex held in alinement by the conical polar portion of a magnet.

1,033,877. Telephone-Exchange System. E. R. Corwin, assignor to Corwin Telephone Manufacturing Co., Chicago, Ill. Provides a special arrangement of cut-off relays.

1,033,883. Electromagnet for Surgical Purposes. G. T. Fette, Cincinnati, O. A powerful U-shaped magnet with specially shaped and adjustable pole tips.

1,033,893. Mercury Motor Meter. J. H. Hodde, assignor to Sangamo Electric Co., Springfield, Ill. Has a tightly fitting sleeve to prevent the escape of mercury between the spindle and wall of the sleeve.

1,033,894. Holder for Flexible Metal-Sheathed Wire Cables. J. P. Holloway, Washington, D. C. Has a pair of rigid fingers with diagonal binding edges and a clamp.

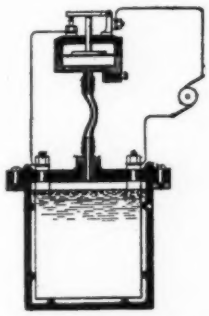
1,033,900. Motor-Controlling Device. G. T. Janette, Chicago, Ill. Variation in fluid pressure opens and closes the motor switch.

1,033,912. Insulating Device. J. H. Lendi, assignor to Belden Manufacturing Co., Chicago, Ill. The wire is first passed through a cleansing device, then through an oxidizing flame and finally through the coating chamber.

1,033,935. Electric Switch. G. B. Reisbach, assignor to Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Two solenoid-operated switches operate in sequence, but are locked together in both open and closed positions.

1,033,938. Telephone-Receiver Shell. F. O. Richey, assignor to Dean Electric Co., Elyria, O. The ear cap is threaded on to the main part.

1,033,963. Ventilating System. E. M. Surprise, assignor to American Telephone & Telegraph Co., Boston, Mass. A ventilator for telephone booths comprises an electric fan connected to the booth by a tube with sound-dissipating baffle plates in it.



1,034,108.—Battery Charge-Limiting Device.

1,033,989. Railway Signal. T. F. Codv, North Yakima, Wash. A semaphore operated by an electromagnet with a rolling armature.

1,034,000. Circuit-Controller. W. H. Durfee, Providence, R. I. A vertically moving and rotatable rod carries conical circuit-closers adapted to move between the rollers of a series of opposite contacts.

1,034,001. Bell-Ringing Apparatus. W. H. Durfee, Providence, R. I. Solenoids operate the strikers.

1,034,002. Storage Battery. T. A. Edison, assignor to Edison Storage Battery Co., West Orange, N. J. The depolarizing material for an alkaline battery is made by mixing freshly precipitated hydroxides of nickel and bismuth, drying, washing and again drying the mixture.

1,034,003. Battery-Cell Container. T A. Edison, assignor to Edison Storage Battery Co. Each cell in the tray is rigidly supported, and separated and insulated from the others.

1,034,016. Underground-Trolley System. A. Kautzky, Los Angeles, Cal. The slot adjoins the inner edge of one rail; the conductor rail is placed between the main rails on the ties; a drain runs beneath the ties.

1,034,018. Manufacture of Tungsten Filaments for Incandescent Electric Lamps. A. Lederer, assignor to Westinghouse Lamp Co. A paste of tungsten dioxide, powdered metallic tungsten and a carbonaceous binder is squirted into filaments, dried, heated and reduced to metallic form.

1,034,022. Conductor for Electric Tugs. G. Meyer, assignor to Siemens-Schuckert Werke, G. M. B. H., Berlin, Germany. A trolley leads current to the motor on the boat and then it passes through the motor-driven friction rollers that engage a submerged return-conducting draft cable.

1,034,041. Illuminating Device. W. H. Spencer, assignor to G. F. Spencer, Newark, N. J. A combined hood and reflector shell throws the light from an incandescent lamp through a colored transparent screen.

1,034,069. Electric Motor. E. W. Brown, Dayton, O. The rotor laminae of a squirrel-cage motor have nonalining groups of slots from the conductors to the periphery.

1,034,077. Illuminating Device. J. A. Carlstedt, assignor to G. F. Spencer, Newark, N. J. Tubular incandescent lamps and reflectors are mounted in a wiring trough.

1,034,103. Conductive Ink. H. E. Goldberg, Chicago, Ill., assignor of one-half to R. P. Lamont. Contains deflocculated graphite in a volatile liquid so as to be a good electric conductor when dry.

1,034,104. Conductive Ink. H. E. Goldberg, Chicago, Ill. Contains colloidal silver in a volatile liquid.

1,034,108. Device for Charging Storage Batteries. E. A. Halbleib, assignor to Northeast Electric Co., Rochester, N. Y. The gas liberated on charge from a sealed cell is led to a diaphragm and, when the gas pressure is high enough, the diaphragm operates a circuit-breaker.

1,034,119. Electric-Circuit-Controlling System. H. B. Kahn, New York, N. Y. Includes electromagnetic primary and secondary locks for a snap switch.

1,034,129. Sadiron. C. P. Madsen, assignor to Pelouze Manufacturing Co., Chicago, Ill. An electric flatiron has a finger switch conveniently arranged on the top of its body.

1,034,130. Electric Heater. C. P. Madsen, assignor to Pelouze Manufacturing Co. A heating element for the above has a single layer of resistance ribbon imbedded in cement close to the bottom of the iron.

1,034,146. Gearing. A. E. Reuss, Cincinnati, and O. Schnitzler, Remington, O. Electric controlling means for a speed-changing gear train.

1,034,148. Attachment for Telephones. W. A. Schmelz, Pittsburgh, Pa. A cup-shaped member is clamped to the receiver and connected to a sound-transmitting tube.

1,034,151. Combination Lock for Electric-Lamp Fixtures and the Like. G. I. Silbert, assignor to Chi-Ill Electric Co., Chicago, Ill. A rotatable sleeve and shell can be locked together.

1,034,156 and 1,034,157. Storage Battery. E. Sokal, Chicago, Ill. The first patent relates to a cell with concentric circular plates and an air pump for forcing electrolyte circulation. The second patent covers a cell with hollow electrodes and forced intermittent electrolyte circulation.

1,034,159. Conductor Coupling. W. Sparks, Jackson, Mich. Includes two sets of binding posts in a metal sleeve.

1,034,160. Electric Primer. H. W. Starkweather, assignor to Winchester Repeating Arms Co., New Haven, Conn. Adjoining the powder chamber is an ignition wire leading to an ignition contact button.

1,034,167. System for Electrically Controlling and Operating Railway-Trame-Controlling Apparatus. H. B. Taylor, assignor to Federal Signal Co., Albany, N. Y. An electric track-switch moving and indicating system.

1,034,180 and 1,034,181. Means for Insulating Rail Joints. B. Wolhaupter, assignor to Rail Joint Co., New York, N. Y. Has separate base and head insulating sections.

1,034,197 and 1,034,198. Means for the protection of Electrical Installations from Excess Voltages. G. Campos, Milan, Italy. In the first patent parallel circuits are protected by inserting a condenser in each one. In the second patent capacity and resistance are shunted across the line wires.

1,034,200. Telephone Receiver. L. W. Carroll, Riverside, Ill. On each side of the diaphragm is a soft-iron cup containing a stem about which are two coils.

1,034,212. Electric Trap. K. Devich, Akron, O. A floor plate is connected to one side of the circuit and a bait-holder to the other.

1,034,219. Electroplating Apparatus. J. W. Dow, Mansfield, O. Includes an endless conveyor for carrying the articles to be plated.

1,034,223. Electrical Alarm. T. Erickson, Ogden, Utah. Contacts are closed by walking on a section of the floor.

1,034,230. Engine-Starting Apparatus. E. A. Halbleib, assignor to Northeast Electric Co., Rochester, N. Y. Includes an electric generator, storage battery, air pump and interconnecting clutches.

1,034,241. Trolley. M. Jakubowski, Windber, Pa. Has a guard on each side of the wheel.

1,034,251. Electric Rat Trap. A. Kita, Epton, Pa. Has electric contact bars on a tiltable trap door.

1,034,261. Audible Signal or Annunciator for Incubators. H. R. Lightcap, Greensburg, Pa. An electric bell arranged as an excess-heat alarm.

1,034,265. Electric Heating Device. C. P. Madsen, assignor to Pelouze Manufacturing Co., Chicago, Ill. Relates to a modified construction of the flatiron heating element described in Nos. 1,034,129 and 1,034,130.

1,034,275. Stop Motion for Looms. H. J. Miller, assignor to American Textile Appliances Co., Boston, Mass. Includes an electromagnet, a double-point terminal and a circuit-closer.

1,034,276. Covering for Wire. C. Moon, McDonald, W. Va., assignor of three-eighths to O. Alexander, and one-fourth to B. Walace. On each side of the trolley wire in a mine is a hinged door normally closed.

1,034,290. Method of Electric Welding. H. F. Parish, New York, N. Y., assignor to Grinden Art Metal Co. Arc welding with a light metal negative electrode that fuses and falls on the work as it is moved over it.

1,034,292. Overhead Trolley. R. A. Peglar, Toronto, Ont. Includes a spring-situated retractor.

1,034,294. Arc Lamp. C. Gonalez-Perez, Madrid, Spain. Has two conveying tubes carrying the carbon electrodes that are fed by pistons.

1,034,343. Means for Cleansing Lamp Bulbs. L. H. Bunker and A. H. Hempel, Warren, O., assignors of one-fourth to G. W. Upton. Incandescent lamps are lighted while moved around a padded cleaning surface on the machine.

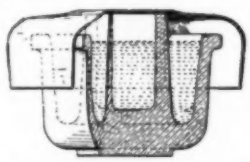
1,034,379. Means for Insulating Rail Joints. B. Wolhaupter, assignor to Rail Joint Co., New York, N. Y. A modification of Nos. 1,034,180 and 1,-034,181.

1,034,380. Thermometer-Holder. W. S. Atchison, Washington, D. C. For electrical contact thermometers; has special contact terminals.

1,034,393. Electric Heater. R. M. Millar, assignor to Millar Electric Co., Chicago, Ill. A toaster with a vertical resistance element.

1,034,394. Insulating Support for Storage-Battery Tanks. G. H. Morris, assignor to Electric Storage Battery Co., Philadelphia, Pa. Consists of an insulator with a channel for oil and a skirted lead-shut cap.

1,034,397. Electromagnetic Device. B. Soldatencow, Paris, France. Includes a solenoid with movable core, adjustable contacts closed thereby and a battery.



1,034,394.—Battery Tank Insulator.

1,034,405. Printing Telegraph. B. Soldatencow, Paris, France. Includes a keyboard whose locked keys are released by a solenoid.

Reissue.

13,453. Means for Automatically Arresting Talking Machines. A. E. Spencer, San Francisco, and F. C. Thomas, Mill Valley, Cal. Original No. 998,807, dated July 25, 1911. Original Reissue No. 13,305, dated Oct. 31, 1911. A brake for a disk record is controlled by an electromagnet.

Patents that Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired August 6, 1912. 1912.

543,836. Alternating-Current Motor. E. Arnold, Zurich, Switzerland.

543,843. Telephone. J. S. Biggar, San Francisco, Cal.

543,855. Short-Circuiting Device for Stopping Dental Motors. F. N. Dennison, Toronto, Canada.

543,865. Electric Meter. J. Harris, Lynn, Mass.

543,866. Construction and Operation of Electric Railways and Tramways. I. W. Heysinger, Philadelphia, Pa.

543,879. Automatically Operated Fire Alarm. F. K. Ludlow, Madisonville, O.

543,885. Electric Battery. R. L. McDonald and A. McDonald, Dalmuir, Scotland.

543,892. Method of and Means for Extinguishing Electric Arcs. W. B. Potter, Schenectady, N. Y.

543,895. Construction of Armatures for Dynamo-Electric Machines. W. B. Sayers, Bearsden, Scotland.

543,896. Fire Alarm. C. F. Scofield, Bridgeport, Ala.

543,900. Electric Arc Lamp. C. E. Scribner, Chicago, Ill.

543,901. Telephone-Exchange System. C. E. Scribner, Chicago, Ill.

543,902. Apparatus for Telephone Switchboards. C. E. Scribner, Chicago, Ill.

543,919. Method of Connecting Ends of Electric Conductors. J. T. Beswick, Brooklyn, N. Y.

543,929. Electric Temperature-Controlling Device. S. A. Elkhorn, Milwaukee, Wis.

543,931. Primary Battery. G. H. Gardner, Boston, Mass.

543,933. Electric Signal for Railway Trains. J. C. Henry, Westfield, N. J.

543,950. System of Electric Distribution. E. Thomson, Swampscott, Mass.

543,960. Electrical Conductor. G. Gray, Boston, Mass.

543,965. Electric High or Low-Water Alarm. B. McCabe, Boston, Mass.

543,966. Circuit-Closer. W. Nutt, Crawfordsville, Ind.

543,978. Electric Condenser. C. S. Bradley, Avon, N. Y.

543,984. System of Multiplex Telegraphy. T. B. Dixon, Henderson, Ky.

543,985. Incandescent Conductor for Electric Lamps. T. A. Edison, Menlo Park, N. J.

543,987. Filament for Incandescent Lamps. T. A. Edison, Menlo Park, N. J.

544,015. Temperature Regulator. G. H. Underhill, and E. Glantzberg. Boston, Mass.

544,034. Electric Lighting System. E. F. Gavin, New York, N. Y.

544,037. Converter System for Electric Railways. T. Harper, New Brunswick, N. J.

544,047. Rheostat. W. O. Meissner, Chicago, Ill.

544,056. Conduit System for Electric Railways. J. Thomas and W. R. Thomas, Catasauqua, Pa.

544,066. Electric Arc Lamp. J. A. Mosher, Chicago, Ill.

544,077. Coin Signal Apparatus for Telephone Pay Stations. S. Alexander, Hartford, Conn.

544,094. Automatic Cutout for Electrical Converters. W. J. Greene, Cedar Rapids, Iowa.

544,107. Magneto-Electric Bell. L. Moore, Brooklyn, N. Y.

544,118. Safety Electric Motor. W. R. Pole, Jr., Altanta, Ga.

544,123. Electric Signaling System. C. A. Rolfe, Chicago, Ill.

544,180. Machine for Making Battery Plates. T. T. Lewis, Philadelphia, Pa.

544,198. Electric Railway. F. Taylor, Charlotte, N. C.

544,209. Electric Railway and Tramway. J. Claret, Lvons and O. Wuilleumier, Clermont-Ferrand, France.

544,224. Electric Alarm Lock for Tills. C. Helm, Indianapolis, Ind.

544,230. Controlling Switch for Electric Motors. W. H. Pohlman, Woodbrook, Md.

544,261. Alternating-Current Motor. R. Lundell, Brooklyn, N. Y.

544,266. Medical Induction Coil. J. Tatham, Philadelphia, Pa.